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ON THE ART OF HELPING OURSELVES.

(THE EDITOR.)

There is an old adage that runs something like this : " He who will not buy, cannot sell." Time has not altered the verity of the aphorism, but the mutability of custom has wrought numerous transformations in the methods of our exchange. Barter has long since given place to money: a symbol, representing wealth, designed to simplify mediums of exchange. Money has given place to a money market, and has become a complicated maze that represents not the wealth of a nation but the money value of its wealth ; and that money value rises and falls according to the pressure of internal and external influences. Thus we find Australia to-day teeming with wealth of varied sorts, and pregnant with potential sources (delightful catch-phrase) of more wealth, with a meagre population unable to assimilate more than a small portion, and yet, in the midst of all this plenty, there abounds poverty and distress.

What is Wealth ? It should be those things needed by a people for their sustenance and well being ; the essentials which provide food and clothing and shelter with something over for little luxuries and sport and amusement ; the right of education and the pursuit of knowledge and happiness. All these Australia has in abundance. There is more than enough in our crops and herds to supply provender for all ; wool to clothe our backs, and hides to shoe our feet ; timber and iron and clay to house the families of the Commonwealth ; fruit and wine and innumerable etceteras to minister to the taste and pleasure of the populace and help build up a strong, virile race. There are enough savants among us to carry on our high standard of education, and a soil and climate rich in fertility to provide for all while the adolescent still continue their studies. Assuredly we have wealth in that sense.

But again, what is Wealth ? Is it an agglomeration of Bonds and Securities, stamped paper and minted coins of gold and silver and copper ; articles that in themselves could not appease a passing hunger and, excepting perhaps the paper, could not raise the temperature of one shivering body ?

There are in this World certain peoples who have cultivated and established an acquisitive faculty for this form of wealth, which, in itself, represents a man's honour and his promise to pay. Just how they manipulate the flow of this wealth so that it will gravitate to their coffers is not easy to comprehend—at least it is not easy to most of us. Yet they manage it, and so they become the Kings and the Captains of Commerce. They are not, as is often misrepresented, a barrel-bellied hang-jowelled, coterie of gourmands, uncomfortably enthroned on bags of bullion. For the most part they are hard working devisers entrusted with the earnings and savings of many who are dependent on them for provision against penury in their declining years, and who look to them to finance their businesses, their homes and their farms, and perhaps their sustenance. They spend much time and energy in designing flows into their reservoir, and directing trade and commerce so that the rake off will add to their accumulations, and enable them to pay the interest their clients must have in return for their capital invested. Much of their method is based upon loans for development of trade and commerce.

Australia has in the past been a huge exporter of promises to pay. A lot matters for what these promises were made, but what matters most of all is that they ARE PROMISES, these nice pieces of stamped paper, and that they represent the Australian standard of honour; and that standard must be maintained. Our promises were accepted as national, and that our national honour ranked high in the World's estimation is evidenced by the readiness wherewith loans were obtainable. We have had a good time spending our promises, and now we have to face the honourable if painful duty of redeeming them. The moral is that we must in future be sparing in our promises and in our acceptance of help from others. We must practise the virtues of self support.

In the past, this is what has happened:

We desired to carry out some great undertaking, so we asked for a loan of money values, and the Kings and the Captains of Commerce said "Go ahead. We will finance it." So far so good, if it were to be reproductive and we carried out the work with the financial assistance given us. But very often we did not. We said "All right, lend us £20,000,000, but don't bother to send it out to us, just spend about 80 per cent. of it amongst your own people and keep them employed making the things we will require for our undertaking. The balance we will want to pay a few workers out here." That suits the Kings and the Captains. It saves them sending the money and helps them to keep their own people in jobs so that their traders and manufacturers get all the rake-off and they send us the manufactured steel and iron and copper and such like. And then when the undertaking is finished we have not had to use our own iron and copper deposits, and we have not had to build big plants and furnaces and things. All that has been done for us and our own deposits are quite new and have never been touched at all. Then the time comes for us to pay back this money we never had, but spent in some other country through some other agent, to keep its people in comfortable employment. Of course we have our nice new iron deposits and copperfields, but we cannot pay them with those because they do not want them, seeing that they have their own. We might pay them in gold, but, alas, we have been in the habit of pouring our gold into those channels devised by the clever Kings and Captains, in order to pay for old loans. So we offer to pay with wheat and wool and hides and things, and as we have not gold we are permitted to send them, but are assured that there are a lot of folks who can supply those commodities, and they too have debts to redeem, and it is surprising how little value there is in our goods to-day. "However," they say, "You better send us all you have and we will see what we can arrange for you." And so to 'save face' we have to send away the wool and the wheat, and our workmen, who were engaged on the big undertaking are out of a job, and

can't get the goods their fellow patriots produced for them because they have to be sent away to some one who places little value on them.

How are we to get out of it ? It is a pretty mess. We have got to pay our debts and feed our people and keep them clothed and sheltered. Let us start on the last proposition first. We can employ a lot of people making our own clothes and our own boots. I do not see why they should not be as good as the clothes and boots from elsewhere, but if they are inferior, then that is our fault, and we have to put up with it and wear them, and we will soon encourage manufacturers to produce the better and more attractive article. Many are doing it now. We could employ a lot of people developing our deposits and manufacturing steel and copper and other things essential to our big undertakings. It would be better to spend £20,000,000 of our own golden sovereigns in Western Australia erecting plants and factories. We would then still have the 20,000,000 sovereigns in the State and the factories as well ; if we send the sovereigns away to buy material from elsewhere, when we have purchased we have lost the opportunity of establishing manufactories, we have lost the sovereigns, and have someone else's goods wearing out in our own State. This is the Royal Road to Poverty. Let the Kings and Captains of Commerce erect their factories on our own shores and employ our people in our State manufacturing for our requirements, and we will all be better off. We can then employ some of their surplus inhabitants if they cannot find work for them. We can raise sufficient food and clothing for all and we can pay their interest and wipe off the old debts. We cannot do it if we continue to borrow goods from them and not gold. 20,000,000 sovereigns circulating in this State would accomplish a tremendous amount of development and we would still have the gold ; £20,000,000 worth of debit notes for work done by other people in other lands leaves us with nothing in our coffers and a heavy responsibility of paying back in goods which can be bought by our creditors from cheap labour and low standard of life countries.

Last year Western Australia imported £20,000,000 of goods, 50 per cent. of which were made in other parts of Australia. What we spent in Australia does not matter so much. We get some rebound from there and the goods are manufactured under our conditions and according to our standard of life. What we purchase from elsewhere matters a lot, because it is money sent away to people who will not take our goods except at the price for which they can be obtained from cheap labour countries.

We must begin to practise the principle in our own State first. £5,000,000 was spent in other parts of the Commonwealth last year to buy goods that are in competition with our own manufacturers. Think of this ! £5,000,000 heedlessly sent away, which, spent here, in one year would give employment to 22,000 adult males at the basic wage. Yet we go on buying indiscriminately whatever goods are offered us. Let us take a few lines of the principal commodities imported from the Eastern States alone : Butter, 58 per cent. of our requirements ; Cheese, 99 per cent. ; Honey, 43 per cent. ; Confectionery, 54 per cent. ; Fruit, juices, 76 per cent. ; Jams, Jellies and Sauces, 89 per cent. ; Vinegar, 15 per cent. ; Jelly crystals, 78 per cent. ; Tobacco and Cigarettes, 90 per cent. ; Boots and Shoes, 64 per cent. ; Bacon and Hams, 65 per cent. ; Knitted ware, 42 per cent. ; Blankets, 85 per cent. ; Rugs, 84 per cent. ; Paints, 10 per cent. ; Crockery and Porcelain, 78 per cent. ; Oatmeal and Wheatmeal, 65 per cent. ; Wine, 55 per cent. ; Furniture, 8 per cent. ; Wearing apparel, 82 per cent. ; Of course it is not only the loss of money that we have to deplore, but there is also the loss of the value of raw material in the State that cannot be developed because we take manufactured articles from other States and Countries. Of course if we do not sell we cannot buy, but the trouble is we have been borrowers and

buyers so long we have neglected the selling side of the business. We have to do a lot of selling to get balanced up. We want to be brotherly and trade with people, and when we buy (and we will always have to buy for we are not self-supporting in all things) we want to know what the seller is going to take from us in return in the way of our goods. If he can't take our goods we don't want his. It is not unfriendly to refuse a neighbour's wares if you have nothing to give him in return, and it is very unfriendly to take his goods if you can't see your way to pay for them. The more self-supporting we can become the less we will have to buy, and the more we can produce the cheaper we can dispose of our surplus. Remember the parting advice of Polonius to his son: "Neither a borrower nor a lender be, for loan oft loses both itself and friend and borrowing dulls the edge of husbandry."

Now having settled this to our satisfaction let us "go to it." Talk it over with your wife and your family, and then with your neighbour. Make it a New Year resolve when you go marketing to ask, "Are these West Australian Manufacture"? After that ask for Australian, and then Empire manufacture, but insist on all locally made goods first. If this principle is followed you will see a lot less unemployed this time next year. We could find employment for all our population with a decent return for their labours if we would use our own raw material and make our requirements. Following the prejudiced, blundering methods of the past we have reached the position where we have borrowed and purchased ourselves into debt, so that we might throw a lot of our good citizens out of employment, leaving them to face Christmas on a mere sustenance pittance; we have hunted our capital away into bonds instead of circulating to create trade and manufacture. We have got to pay the piper. Let us pay him and get rid of his jarring discords, and let us lay hold of a new melody that will lift us along the road to harmony and prosperity.

LUCERNE—THE QUEEN OF FODDER CROPS.

GEO. L. SUTTON,
Director of Agriculture.

It is fitting that "Lucerne," or "Alfalfa," because of its particular suitability for the nourishment of young stock of all kinds, should be associated in the minds of farmers with maternal qualities, and in consequence called the "Queen" of fodder plants, just as Maize, with its sterner characteristics and greater suitability as a food for adult animals, is called the "King" of fodder plants. As food, each is complementary to the other, and their alliance when brought about on the farm is followed by the happiest results.

Lucerne was introduced into Greece during the Persian Wars, about 490 B.C., so that it is known to have been cultivated for well over 2,000 years. It has therefore been well tested. It was taken to Spain by the Moors under the name of Alfalfa. The Spaniards introduced it to Mexico, and from that country it spread over South America and extended to the United States and Canada. In Canada and America lucerne is known and cultivated as "Alfalfa." This word is believed to be of Arabic origin, and derived from words which mean "the best fodder." It will thus be seen that its great value for fodder purposes has been long recognised, and the splendid reputation which this plant so early earned, and which by its name has come to us down through the centuries, it still maintains.

It has been thought that the name Lucerne, by which it has been known in England and France, was derived from the Swiss canton of the same name, but Coburn in the "Book of Alfalfa" considers this to be a mistake, as it was not known there until long after it was cultivated in France and England. He states that:—"The name Lucerne is probably derived from the Spanish word 'Userdas,' which the French changed to 'La euzerdo,' and later to 'Luzerne,' still later to 'Lizerne,' and then to 'Lucerne.'"

The botanical name of Lucerne is *Medicago sativa*. It belongs to the family of leguminous plants, of which it is probably the best known and most valuable member. It usually grows from 1 to 2½ feet high, but occasionally taller. It is a deep-rooting, remarkably long-lived and prolific perennial. Under the best conditions it may be cut many times a year, and year after year. It is stated that there are lucerne fields in Mexico over two hundred years old, and others in France which are known to have been productive for over a century. There is no reason to believe that it will not be equally long-lived under Australian conditions if established on suitable soil, suitably manured, and given reasonable attention. The intensive lucerne plot referred to in the issue of the "Agricultural Journal" for April, 1924, had then been established for seven years (it is now 13 years old) and is still flourishing, and shows no signs of exhaustion. Its deep roots penetrate readily to 10 to 20 feet, and have been traced to much greater depths. Coburn records a case where the roots were found penetrating through crevices in the roof of a tunnel one hundred and twenty-nine feet below the surface of a lucerne field.

CLIMATE.

Lucerne loves heat, and makes its maximum growth in spring and summer. It is at its best when plentiful supplies of water are found in combination with heat. Under such conditions, which usually involve irrigation, it is remarkably prolific, successive cuttings of luxuriant forage being obtained at intervals of five to six weeks, with an aggregate yield per acre of 20 to 25 tons of green fodder, or, if made into hay, of six to eight tons. Owing to its deep-rooting system it is well able also to withstand extremes of temperature. The writer when in New South Wales has found it growing as far north as the Queensland border, and south not far from Kosciusko. It is also well adapted to withstand summer drought. Grown experimentally without irrigation at Chapman and Merredin Experiment Farms, it has proved that it will live for several seasons through dry summers, remaining dormant during the dry weather, awaiting the summer showers or the winter rains to spring to activity.

It is believed that there is no part of the agricultural area in which this plant cannot be made to serve some useful purpose. For maximum returns for fodder or hay, irrigation will probably be necessary in most districts, but even in the drier areas sufficient information is available to indicate that it is likely to prove useful for grazing. It is anticipated, however, that its greatest usefulness will be in the Dairy Belt, and because of its great fodder value no dairyman should be without his lucerne patch.

SOIL.

Lucerne is not particular as to soil. With suitable treatment it will grow on almost all classes of soil, from nearly pure clay to light sandy soil. At one time it was thought that it would only grow on rich, deep alluvial soil, but experience has shown that there is hardly any kind of soil on which it will not

grow provided the soil is not waterlogged or sour. The most favourable soil is a rich, somewhat sandy loam, warm and friable. The highest yields are obtained with the least trouble on the very best alluvial soils found on creek and river banks well supplied with plant food and with free water from 6 to 20 feet below the surface. At one time the heavy clays were considered unsuitable, but cases are recorded where excellent crops have been raised on soils of this character, but more care is required in preparing the seed bed than on the friable loams. Whilst lucerne can utilise enormous quantities of water during the growing period, it is killed by stagnant water lying upon it. A case is known, however, where the flood waters from the Hawkesbury River remained on the lucerne paddocks for eight days during the winter, when the roots were partially dormant, and without doing it any permanent injury. In this instance the deposit left round the plants was removed as soon as the waters receded.

“Lucerne will not stand wet feet” aptly conveys the meaning of the rule that if the soil is not naturally drained to a depth of several feet, action must be taken to bring about this condition before the lucerne is planted.

PEPARATION OF SEED BED.

Lucerne likes a compact seed bed with just a little loose soil on top, and as the lucerne seed is small the soil should be well prepared. Though the lucerne plant when established is one of the hardiest of plants, yet when young it is delicate and require favourable conditions for its support. The seed bed therefore should be warm, mellow and compact, with just a thin layer of loose



Experimental Lucerne Plot—Merredin, 1919.

soil on top. It is essential that the seed bed proper be compact, in order that the seed may germinate readily and the soil moisture move most freely in all directions to convey the necessary nourishment to the young plantlet. The compact soil in which the seed is deposited should be covered, however, with a layer of loose soil, thin enough for the small and tender plant to force its way through, so that the evaporation of the moisture brought near the surface by the compaction of the underlayers for the use of the roots will be lessened.

Because of these requirements it is generally advisable to commence the preparation of the land some time before sowing, usually by fallowing, and the ploughing can then be deep. Except in rare instances the ploughing should not be done later than at least six weeks before the seed is to be sown, for if ploughed later than this it is difficult to get the seed bed into that compact condition which is so essential for the best results with the establishment of this crop. The planting of the seed on a loose seed bed is a frequent source of failure with the lucerne crop. It is also advisable that the seed bed be as free from weeds and weed seeds as it is possible to get it, for the delicate young lucerne plant cannot compete with the hardy young weeds of a dirty seed bed, though when established the reverse is the case for it is the hardest of plants, and but few weeds can compete with it. In its early stages weeds are very formidable and serious handicaps, and it is believed that more failures are due to the presence of weeds amongst the young lucerne plants than to any other cause.

An experiment to ascertain the effect in this connection was carried out at the Merredin Experiment Farm in 1919. This experiment was planted on forest land. The plots were one-fortieth of an acre in area—25 links wide and one chain long. The seed bed was well prepared by fallowing; on one plot the weeds were destroyed, on the other they were allowed to grow. The rainfall subsequent to the planting was good, and to the end of the year was as follows:—April, 302 points; May, 17 points; June, 105 points; July, 233 points; August, 164 points; September, 43 points; October, 186 points; November, 38 points; December, 9 points. The seed germinated well on both plots.

On the hand-weeded plots, the lucerne plants grew well. On 9th October the average height of the lucerne plants was 18 inches, and about one-fifth of them were in flower. It was then cut with a scythe and weighed; the green material was allowed to remain on the plots until cured as hay, when it was again weighed. The computed yields per acre in each case were:—Green weight, 61 cwt.; hay weight, 29 cwt. 3 qrs.

On the unweeded plots the weeds, mainly barley grass, grew apace and so thickly that only a few plants of lucerne were visible. This weed growth was cut off at the same time as the lucerne on the other plots, after which the vegetation remained dormant until the rains in March. Some plants were then noticeable on these plots, but there were neither as numerous nor as vigorous as those on the plots which had been weeded.

The difference in the results obtained from the weeded and unweeded plots brings out in a marked manner the necessity of freeing young lucerne plants from the more vigorous weeds. It shows that as it is not a commercial proposition to control the weeds on a large area by hand-weeding, it is essential to obtain a seed bed as free from weeds as is possible by destroying them before the lucerne is planted. The importance of securing a seed bed free from weeds is so thoroughly recognised by one of the most successful growers of lucerne in the wheat belt of New South Wales that it was his practice to commence to prepare for lucerne three years before it was sown. This does not mean that the land was uncropped for that period, but that the cropping adopted was such as would tend to destroy weed growth. As the crop is a perennial one, the thorough preparation of the seed bed necessary to make it free from weeds and compact is justified.

SEASON TO PLANT.

In warm and particularly the dry districts of Western Australia autumn sowing, i.e., in March and April, is likely to give best results, provided weeds can be controlled. Rain usually falls then and the ground is warm to ensure

a good germination of the seed and a vigorous growth of the plants. During the winter plants have opportunities to make a good root growth, so that the plants become strong enough to stand the hot weather of summer. On the other hand, where weed growth is troublesome, in cool districts with a liberal rainfall spring sowing may be advisable. When spring sowing is practised the ground should be fallowed in autumn or winter, so that the cultivation in winter and spring will afford opportunities for destroying weeds. This is the plan so successfully adopted in the southern districts of Wagin, Katanning and Gnowangerup, where considerable areas are planted for pasturing sheep.

DODDER.

Dodder (*Cuscuta* spp) is a parasitic plant vine which grows from seed. It is probably the most serious lucerne pest the grower has to face. The seed germinates in the soil and retains its connection with this until it comes into contact with the stem of the lucerne plant. It then severs its direct connection with the soil and lives upon the juices of its host, the lucerne plant, until it ripens its seed or has killed the host. Once started dodder continues to grow and spread by means of its tendrils, which grow from one plant and catch other adjacent ones. The plants first attacked begin to die and the pest spreads out in all directions.



Lucerne and Dodder.

The tiny seed of this pest is sometimes found in an admixture of lucerne seed, and because of this disastrous effect upon the crop precautions should be taken to prevent it being introduced with the lucerne seed which is being sown. Though some dodder seed can be separated from lucerne seed by suitable cleaning machinery because of the difference in their relative sizes, yet, because of the vital importance of not introducing dodder, only seed which has been harvested from crops known to be free from dodder should be used.

It may be, however, that despite the precautions taken, dodder has established itself. Every effort should be made to eradicate it. If very generally established, probably the best way of dealing with this pest will be to plough up the paddock and grow other crops upon it for a number of years until all the dodder seeds have germinated and the plants arising therefrom have been killed. For dealing with isolated patches the usual method recommended is to mow or hoe them, cover them with straw, and burn the dried material. Close and repeated grazing for some time may also prove effective, as the animals are likely to eat the dodder quite close to the ground and prevent it forming seed. Mowing has proved ineffective owing to the fact that little tendrils of the dodder plant are left on the lucerne stems near the ground and below the cut surface of the lucerne.

VARIETIES.

There are several kinds of Lucerne. These are, however, types rather than varieties, and are mainly of localised character and usually distinguished by the name of the country in which they have been grown, e.g., Peruvian, Turkistan, Arabian, African, etc. Many of these have been tried in Australia and at the Chapman Experiment Farm. The results obtained there are in accord with those obtained in the Eastern States, and are to the effect that none are as suitable for, or as prolific under Australian conditions, as the Australian type, which has been evolved as the result of the survival of the fittest. Growers should therefore insist upon being supplied with Australian seed, most of which now comes from New South Wales. Realising the superiority of seed produced in the Commonwealth, the Federal Government now insists that all imported seed shall be stained pink, so as to make it readily distinguishable from the local seed, which in colour ranges from green to purple. Most of the seed produced in the Commonwealth is grown in New South Wales in the Hunter River, Tamworth, and Mudgee districts.

During recent years advertisements have appeared in the agricultural press claiming very distinct advantages for certain strains of lucerne, the roots of which are offered for sale. These roots are said to be the progeny of a selected surface rooting plant, and it is claimed that planting them will result in the establishment of a superior type of lucerne. As the result of very careful inquiries growers cannot be advised to purchase these roots, as there is no evidence to show that they have any advantage over the best strains of the Australian variety. In this connection the following warning was issued by Mr. H. Wenholz, Director of Plant Breeding, New South Wales Department of Agriculture:—

“Any lucerne grower knows how variable in composition his lucerne field is, consisting as it does of plants which vary considerably in habit, growth, leafiness and response to climatic conditions. The Department has had some of the well advertised lucernes under observation, and has not seen in any of them anything superior to what exists in isolated plants in any lucerne field. Growers are advised to accept with much caution the optimistic announcements being made with regard to new lucernes, especially to those the distribution of which is being effected by roots.”

Good seed of the right kind is essential, and therefore the grower should see that he obtains it by using Australian-grown seed. The seedsmen are required to guarantee the germination and the maximum percentage of weed seeds and impurities in the samples offered. A good sample should have a germination of about 75 per cent., and should not contain by weight more than $\frac{1}{2}$ per cent. of weed seeds and of impurities. The sale of lucerne containing dodder and other noxious weed seeds is absolutely prohibited.

RATE OF SEEDING.

The amount of seed depends upon the purpose for which the crop is intended. For hay-making purposes the amount sown by farmers ranges from 6 to 25 lbs. per acre. If, however, it is intended that the crop shall be grazed, the quantity sown is much less and ranges from 2 to 8 lbs. per acre. In some of the lucerne growing districts of the Eastern States where lucerne hay is the staple crop the practice is to sow about 25 lbs. of seed per acre, and growers have been known to state that they would prefer to sow 30 rather than 20 lbs. per acre. This attitude is due to a realisation of the fact that many causes operate against plants succeeding and prevent more than a small percentage of the seed from producing healthy established plants; the young seedlings are tender and have difficulty in reaching the surface after germination. During the process of covering many of the seeds sink too deeply into the soil, whilst many remain quite near or on the surface and fail owing to insufficiency of moisture. Further, whilst the lucerne crop is being established a process of elimination occurs, weeds rob the soil of the fertility, use up moisture, and compete with the lucerne for light. This makes the plants thin and spindly and generally saps their vigour, and in consequence it is only the strongest plants which survive.

It is considered that, when established, a stand of some 500,000 plants per acre is ample. Seeing that 1 lb. of lucerne seed contains about 220,000 seeds the use of from 2 to 3 lbs. of good seed per acre would meet these requirements, and though it is recognised that a farmer should not run the risk of a thin crop as the result of being niggardly with the seed, it is considered that the use of 6 lbs. of good seed on well prepared land allows for the many contingencies referred to, and that to use more than 12 lbs. is unduly extravagant.

METHOD OF SOWING.

Except on loose, drifting sands lucerne should not be sown with a nurse crop. There is a general agreement amongst experienced lucerne growers that if lucerne succeeds with a nurse crop it is in spite of the additional drain upon the soil moisture instead of by reason of it. This is particularly applicable to dry climates, for when there is only a limited supply of moisture available, all this will be required to germinate the seed and give the young plant a vigorous start in life.

The seed is usually broadcasted and should be sown near the surface. The seed may be broadcasted either by hand, by a hand broadcasting machine of the "Cahoon" or similar type, or through the grass seeding attachment of the ordinary grain and fertiliser drill. An even distribution of seed is desirable; it is not easy to obtain this by broadcasting with such small quantities of small seed. When necessary to sow by hand it is convenient to follow behind a roller or harrow, so as to have a clearly defined area on which to sow. The small quantity of seed used is dealt with by using the finger and thumb instead of the whole hand for picking up and spreading the seed; and sometimes to facilitate the work and ensure more even distribution the seed is mixed with dry soil or ashes. When the hand machine is used a small quantity of seed can be sown best by turning the handle the opposite way to the usual one. The seed can be sown down the seed box of the grain and fertiliser drill if mixed with some bulky material like bran. It is sometimes mixed with superphosphate and sown through the fertiliser box, but this method is not recommended on account of the destructive action of the fertiliser on the vitality of the seed. When sowing the seed through the "shoes" of the drill grain there is some risk that the seed may be



Lucerne at Nabawa. Grown by Mr. S. E. Gould.

planted too deeply, but provided this risk is known it can be guarded against and avoided. When sown down the tubes of the grain drill the seed can be deposited on the surface by removing the tubes from the "shoes," and at the same time a broadcasting effect can be obtained by arranging for the seed to be dropped on to a sloping board fixed with an inclination of about 30 degrees to the ground.

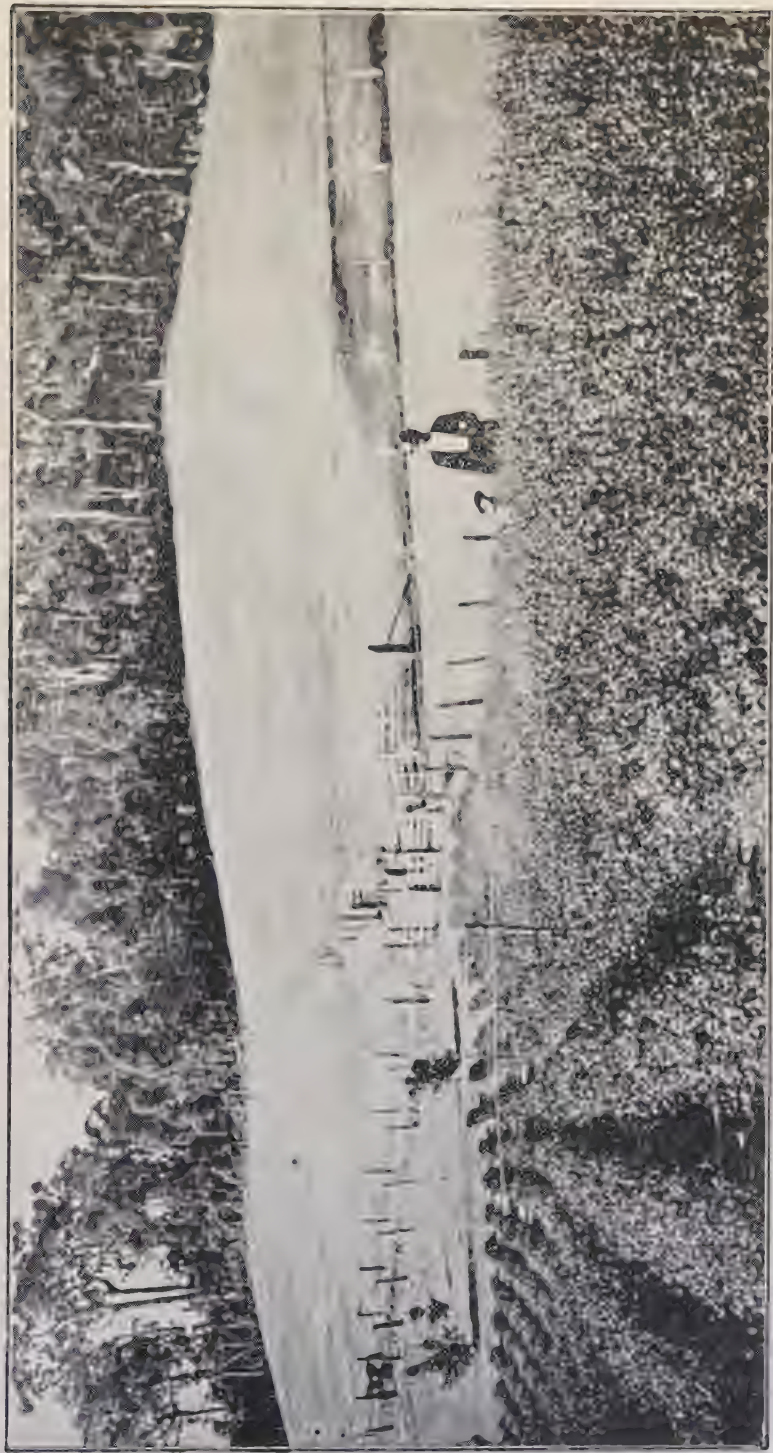
The seed is sometimes sown in drills which are far enough apart to admit of intertillage. This method is believed to be the best for dry districts, and particularly for places where weeds are troublesome, and for small patches. It is further recommended as the method to be adopted when determining the suitability of new locations for this crop. The results obtained by Mr. A. C. R. Loaring at "Lawnbrook," Bickley, with lucerne in drills 2ft. 9in. apart, and recorded in the "Agricultural Journal," April, 1924, prove that there is no need to fear lessened yields from the adoption of this method, and it has several distinct advantages. It enables the land between the rows to be kept loose by cultivation, as the result of which loss of soil moisture by evaporation is reduced to a minimum, and the water is conserved for the use of the crop. Another advantage is that the cultivation given to conserve the moisture also destroys weeds, thus preventing the crop from being robbed of the plant food and moisture which the weeds would use for their growth. It has the further advantage that a saving of seed is effected when planting in this way, for, assuming that only 50 per cent. of the plants were obtained from the seed planted, 2 lbs. of seed will provide 15 plants per foot of row if the rows are 3ft. apart. The seed is covered either by rolling or by harrowing with a light or brush harrow, but it is best covered by the joint operations of both rolling and harrowing. The rolling presses the seed into the soil, and in this way the germination is assisted; it is, however, undesirable to leave the surface compacted and smooth as left by the roller, for this tends to draw the moisture to the surface where it can be evaporated, and in addition a rolled surface crusts readily after a shower. These disadvantages can be overcome by lightly harrowing the rolled surface.

INOCULATION.

Lucerne, in common with other Legumes, is able to obtain the nitrogen for its requirements from the free nitrogen of the air, which contains about 80 per cent. It is enabled to use the free atmospheric nitrogen by the aid of certain vegetable organisms which derive their sustenance from the nitrogen of the air and the starch of the plant. When acting in this way the presence of these bacteria can be noticed by the appearance of wartlike nodules or tubercles on the roots, the nodular swellings are filled with the micro-organisms and are usually in clusters. Some are as small as a pin's head, others as large as a pea. It was thought at one time that each legume—lucerne, clover—had a distinct organism, but now it is believed that legumes of closely related kinds have the same organism and will pass from one kind to another. Thus the bacterium found on "White Sweet Clover" and on "Burr Medic" or "Burr Trefoil" have proved to be also suitable for lucerne, and similarly the one found on the Pea suitable for the Broad Bean or Vetch.

These nitrogen collecting bacteria do not act when there is an abundance of nitrogen in the soil available for the use of the legumes. They so to speak, become lazy.

Seeing that in soils deficient in nitrogen lucerne will be dependent upon the presence of nitrogen-gathering bacteria for its supplies of nitrogen, it follows that if they are not present its development will suffer and will be shown by



Lucerne in Drills—'Lawnbrook,' Bickley.

the pale colour of the foliage. It is important, therefore, to have these organisms in the soil; in fact lucerne cannot be a complete success without them. Fortunately there is no record of their absence in any place where lucerne has been tried, to date, in Western Australia, and because of the manner in which clovers flourish throughout this State there is every reason to believe that they will be present naturally right throughout the agricultural areas. If, however, they should prove to be absent, they can be introduced, and this process is called inoculation. In the past the most generally adopted method of carrying out the inoculation has been to distribute over the new land intended for lucerne a small quantity of the surface soil from an old established lucerne patch. Soil containing or infected with the required bacteria, at the rate of about 100 to 200 lbs. per acre, is harrowed in with the seed or just before sowing. The danger attendant upon this method is the risk of introducing weed seeds, fungus diseases, or eelworms. Another method without the same risk is the distribution of finely cut up or ground lucerne hay with the seed or the feeding of lucerne or clover hay to the stock some time before the seed is to be planted.

It was found that these nitrogen-fixing bacteria belonging to the different groups of legumes can be isolated and prepared for distribution in convenient form as "cultures." This scientific discovery was developed to such an extent that "cultures" for the different legumes were used with great success by mixing them with seed before sowing. Recently reports from England indicate that good results have followed the application of these "cultures" to old lucerne fields.

"Cultures" for lucerne and other legumes are now prepared in the laboratory of the Pathological branch of the Department and are supplied to farmers for a small fee.

The effect of lime is to encourage the growth of these bacteria. If the crop is not suffering from excess water, and there are evidences—such as the pale colour of the leaves, or the absence of the nodules on the roots—that the necessary bacteria are not functioning, mild lime at the rate of about one ton to the acre should be applied. On sour and sandy soils a similar dressing of mild lime is also recommended to be supplied at least one month before the seed is sown. In addition to stimulating the bacterial activity already referred to, it will also have the effect of correcting the acidity which is so detrimental to success with lucerne.

MANURING.

Lucerne is a heavy feeder. Under suitable conditions twenty tons of green crop may reasonably be expected in a season, and this would contain about 340lbs. of nitrogen, 60lbs. phosphoric acid, and 250lbs. of potash. Fortunately, except during the period immediately following germination, this plant is not usually dependent upon the soil for its nitrogen supply. Being a legume it can, when suitable bacteria are present, obtain all its requirements in this connection from the inexhaustible supply contained in the air. But the phosphoric acid and potash must be obtained from that already in the soil or from fertilisers applied to the soil. On fertile loams it may be assumed that the soil will contain sufficient nitrogen to meet the requirements of the young lucerne plant, and supply its needs until the necessary bacteria are sufficiently plentiful to enable it to secure all its needs in this connection from the air. Because the young plant requires to obtain its early nitrogen requirements from the soil, a small application of nitrogenous manure—sulphate of ammonia, blood, or nitrate of soda—is, however, recommended for sandy soils or others deficient in nitrogen-forming material. Guided by experience in the Eastern States, it is unlikely that, except in sandy

soils, potash manuring will be necessary in the early stages, but it is equally likely that manuring with phosphoric acid will be followed by marked beneficial results. An application of from 2 to 3 cwt. of superphosphate per acre is recommended on all soils, even the best.

On loams poor in organic matter it will be advisable to supplement the superphosphate with an application of sulphate of ammonia up to 100lbs. per acre, so as to meet the requirements of the plant for nitrogen until it is sufficiently established to obtain what it needs from the air. On such soils the fertiliser recommended is therefore:—superphosphate, 3cwt. per acre, sulphate of ammonia,



Lucerne at Wagin. Grown by Mr. G. A. W. Piesse.

1cwt. per acre. The fertiliser recommended per acre for sandy soils or those deficient in plant food is a complete one consisting of, say:— sulphate of ammonia, 100lbs.; superphosphate, 400lbs.; muriate or sulphate of potash, 400lbs.

Except in soils unusually rich it will be necessary to fertilise the crop annually. Subsequent applications of fertilisers should be governed largely by the returns aimed at or secured. If the soil is not rich enough for its latent fertility to be drawn upon, or if it is desired to replace the plant food removed by the crop, then an application of superphosphate 14lbs., sulphate or muriate or potash 25lbs., is recommended for every ton of green lucerne removed.

Well saved stable manure is very suitable for this crop, for in addition to the plant food it contains it also supplies organic matter to the soil, and this improves

its mechanical condition. If kept on the surface it acts as a mulch to conserve the moisture and will be of considerable assistance in preventing the formation of a crust on its surface. The great drawback is the weed seeds it contains for these, unless killed as the result of rotting, are likely to destroy the young lucerne plants. This objection is therefore lessened when the manure has been well rotted and is not serious when applied to well established lucerne beds.

On sour and sandy soils a dressing of air slaked lime or ground stone at the rate of 20cwt. per acre is recommended as a preliminary dressing to be applied at least one month before the seed is sown. This will have the effect of correcting acidity and stimulating bacterial activity.

TREATMENT AFTER SOWING.

Even in the best prepared soil, weeds are likely to spring up, for most soils, and particularly old and fertile ones, contain dormant weed seeds, and these germinate with the lucerne seeds and become a menace to its success. It is not possible to cultivate the ground to destroy the weeds which may grow amongst the recently-planted lucerne, for in its young state it is so delicate and with so little roothold that even a harrowing is likely to pull out or damage a considerable number of plants. Lucerne planted in the autumn will rarely be strong enough to be cultivated before the following spring, or that sown in spring before the following autumn. Short of hand-pulling, which is only possible on small areas, the most practical method of controlling weeds in young lucerne is to mow or graze them. If this latter plan is followed the grazing should be done with small stock and as quickly as possible. The mowing can be commenced when the lucerne plants are four to five inches high, and repeated after a short interval, say, a month. This mowing, though detrimental to weed growth, will not injure the lucerne, but rather will stimulate it. Usually the material from the first mowing will not be worth gathering, and it can therefore be left, with advantage, to mulch the ground. As the object of this mowing is to destroy the weeds it should be undertaken whenever they are plentiful enough to warrant it, irrespective of the condition of the lucerne plants and the necessity for utilising the crop. It is emphasised that mowing does not injure but stimulates lucerne. When the young plants have a firm roothold, and this can be determined by pulling at them, cultivation of the soil can take place with advantage. Its effect will be to stimulate the crop by letting air into the soil for the benefit of the nitrogen-fixing bacteria, and by conserving the soil moisture. For the first cultivation a light harrow is probably the best implement to use, but as the lucerne gets older much stronger implements, such as the springtooth cultivator or disc harrow can be used. One of the best implements for the purpose on established lucerne—over two years old—is the disc harrow. To one not accustomed to its use it may be thought that it will destroy the lucerne as well as cultivate the soil. This, however, is not so. The discs should not be given too much angle, and they will then split the lucerne crowns and cause them to throw up additional stems.

When the soil of an established lucerne bed becomes hard it can be disced and cross-disced to loosen it up with most beneficial results. There need be no fear that surface cultivation will kill the plants, as they are too deeply rooted to be injured, and the splitting of the crowns is beneficial. Discing and cross-discing is extremely useful should the paddock unfortunately become infested with couch grass. On one occasion the writer had reason to deal with such a paddock, and so badly infested with it that the treatment decided upon was desperate and almost in the nature of a forlorn hope. The ten-acre paddock was double disced twice both ways. The result was astonishing. The lucerne grew

with such astonishing vigour as to keep the couch under control when aided by the usual periodical cultivations with the disc, and because of the success which followed this drastic treatment, and which proved that couch grass and weeds could be controlled in established lucerne patches, additional acres of lucerne were planted on that farm.

FEEDING LUCERNE.

Lucerne as a food is particularly valuable for the protein it contains. Henry gives the average digestible nutrients in freshly cut lucerne and green fodder maize as:—

Digestible nutrients per 100lbs.					
		Protein.		Carbo-hydrates.	Fat.
Green fodder maize	..	1.0	..	11.6	0.4
Green lucerne	..	3.9	..	12.7	0.5

From this it will be seen that green lucerne contains nearly four times as much protein as green maize.

The nutrient protein is the most expensive of our food constituents and is essential for the production of lean meat, wool, milk, and eggs. Young animals, cows in milk, and laying hens require much protein, and because of the large amount of protein which it contains lucerne is very suitable for these animals. It can in many instances profitably take the place of bran or oilcake in the ration, particularly of milking cows, and which farmers may have to purchase in order to utilise profitably and economically the other products of the farm, or to maintain a continuous milking period.

Comparative analyses of bran and lucerne hay, as given by Henry, are as hereunder:—

Digestible nutrients per 100lbs.					
		Protein.		Carbo-hydrates.	Fat.
Lucerne hay	..	11.0	..	39.6	1.2
Wheat bran	..	12.2	..	39.2	2.7

From the above the similarity between the two is obvious, and it is estimated that in practice 11lbs. of good lucerne hay is equal to 10lbs. of bran. In one respect lucerne has a very decided advantage over bran, and that is as a food for pigs. Lucerne is one of the best foods and bran one of the worst for these animals. In the United States of America large numbers of pigs are regularly pastured upon lucerne, and in this connection it is estimated that a vigorous patch of lucerne will carry 15 to 25 pigs per acre, and the pigs will make a gain of about 100lbs. during the season. Whilst grazing lucerne with pigs it is best to supplement it with an allowance of grain, like maize or wheat. For fattening purposes lucerne will not be found economical if fed alone, but when fed alone all its protein cannot be digested and though the animals increase in weight such increase is principally of bone, blood, and muscle. For fattening animals lucerne requires to be supplemented with foods like maize, wheat, and oats, and other foods richer than lucerne in carbo-hydrates and fat.

HAYMAKING.

The object of transforming the green material into hay is to get rid of excessive moisture so that the hay when stacked will not heat too much or become mouldy.

Lucerne is much more difficult to make into hay than the cereals. This is because of the very sappy character of the stems, which do not dry as readily as the leaves. These latter are the most nutritious part of the plant, and if they become very dry are likely to fall off the stem during the operations of hay-making. The great object to be achieved therefore is to regulate the drying as far as possible so that the leaves and stems dry simultaneously. The principle underlying the procedure necessary for this is founded upon the fact that the leaves until they are so dry that they cease to function will transpire quite a lot of water and which they will draw from the sappy stems. The methods to be adopted should therefore aim to keep the leaves limp as long as possible, as whilst in this condition they will be drawing sap away from the stems very effectively. In practice the hay is made as far as possible in the windrows or in heaps or "cocks."

Lucerne may be cut at any time for green feed, and it may be accepted as an axiom that it is better at all times to cut early than late. Some farmers commence to cut the crop for hay shortly after the first flowers have appeared, others when the lower leaves begin to change colour, in some instances this latter may happen and the leaves begin to drop and the stems



Lucerne at Denmark. Grown by Mr. J. Haine

harden before the blooms appear. Unless the weather is very unsuitable for haymaking the mowing should not be delayed or loss may occur in three ways; in the first place the later cut or more mature material is less digestible, for after flowering the food constituents are transferred to the upper portions of the plant, the stems harden and become less digestible than when younger; in the second place some of the leaves wither and drop off and this results in loss in weight, and finally, deferred cutting leads to poorer growth in the succeeding crop and may also result in a lessened number of cuttings during the season because of the greater time which the respective cuttings occupy the land.

The following table showing some results obtained at the Utah Experiment Station in a feeding test indicates the loss of nutriment following upon delay in cutting.

Stage of growth and beef lbs. produced per ton of hay—

When 1-10 in bloom—706 lbs.

When in full bloom—562 lbs.

When 1-2 of blooms have fallen—490 lbs.

At the Kansas Experiment Station results obtained and the decline in the protein content consequent upon later cutting are as follow:—

Stage of growth and protein content—

When 1-10 in bloom—18.5 per cent. protein.

When 1-2 in bloom—17.2 per cent. protein.

When in full bloom—14.4 per cent. protein.

The first cutting for hay is ready early in spring, and except in the wheat areas this crop will be difficult to make into hay on account of its sappy nature and the lack of much sun heat at this time. If this cutting can be used for feeding to stock in its green state it is advisable to use it in this way. The second and succeeding crops are much more easily converted into hay. In New South Wales when a crop of seed is required the third crop is usually utilised for this purpose, as the flowering at this period is usually more uniform than at others.

Lucerne is usually mown with a scythe, mowing machine, and on occasions with a reaper and binder; it should be cut as close to the ground as is possible without injuring the blade, so as to get the maximum amount of material and to force the new growth from the crown instead of from the joints of the old stems. The usual practice is to start when fine bright weather is expected and as early in the morning as is possible, but not until any dew which may have been deposited has evaporated. It is undesirable that the cut material be allowed to remain in the swath too long, especially if the weather be hot, for extreme heat causes rapid drying of the leaves, and these are likely to fall off during the subsequent operations. If it is allowed to remain just long enough to wilt during bright fine warm weather, this will take only a few hours, whereas with cool moist conditions it may take as many days. After being wilted the material should be raked at once into windrows. If the day is a bright sunny one and the mower has been started in the morning, the rake can be started at mid-day, and should catch the mower before night. The next morning the material in the windrows can be placed into heaps or "cocks," and if the weather remains favorable it is probable that the lucerne will be fit to stack the following morning.

Sometimes during hot weather the curing is completed entirely in the windrows, which should be made loose so as to admit the air freely, but in cool damp weather it will be advisable to place the material in "cocks" and allow the curing to finish in them. When dry enough or "cured," the hay is ready to be carted for stacking or baling. This is determined by an examination of the stalks, which need not be dry and brittle, but tough, though without any sap being noticeable when the stems are twisted tightly.

Just before carting, the "cocks" are sometimes turned over to expose the bottom hay for an hour or so to the sun, so as to dry off any hay that may be slightly damp owing to its proximity to the ground. Sometimes in very hot weather the hay becomes too brittle as the day advances, and there is a danger of losing the leaves, and the carting has to be confined to the mornings.

The time occupied from mowing to carting will vary with the season and according to the weather prevailing during the operations. Usually it is under three days, but may be as short as 24 hours. An extreme case is that of Mr. P. Reynolds, "Hobartville," Richmond, who on one occasion stacked his hay in the shed 16 hours after cutting.

Lucerne hay does not shed the rain well, and when stacked in the open should be thatched or protected in some other way from rain. It is best stored in sheds, and should not be stacked on the ground or on a raised straddle of earth; it requires a foundation or straddle of poles to admit air to the bottom of the stack. If stacked on the ground some is sure to spoil.

SUMMARISED.

Lucerne has many virtues, these have been summarised in most picturesque language by Geo. L. Clothier, of whom it is stated by Coburn in the "Book of Alfalfa" that he has studied his subject closely in the field, in the feed lot and the laboratory. His summing up is as follows:—

"The cultivation and feeding of alfalfa mark the highest development of our modern agriculture. Alfalfa is one of nature's choicest gifts to man. It is the preserver and the conservator of the homestead. It is peculiarly adapted to a country with a republican government, for it smiles alike on the rich and the poor. It does not fail from old age. It loves the sunshine, converting the sunbeams into gold coin in the pockets of the thrifty husbandman. It is the greatest mortgage lifter yet discovered.

"The alfalfa plant furnishes the protein to construct and repair the brains of statesmen. It builds up the muscles and bones of the war-horse, and gives his rider sinews of iron. Alfalfa makes the hens cackle and the turkeys gobble. It induces the pigs to squeal and grunt with satisfaction. It causes the contented cow to give pailsfull of creamy milk, and the Shorthorn and whitefaced steers to bawl for the feed rack. Alfalfa softens the disposition of the colt and hardens his bones and muscles. It fattens lambs as no other feed, and promotes a wool clip that is a veritable golden fleece. It compels skim-milk calves to make gains of two pounds per day. It helps the farmer to produce pork at a cent and half a pound and beef at two cents.

"Alfalfa transforms the upland farm from a sometime waste of gullied clay banks into an undulating meadow fecund with plant food. It drills for water, working 365 days in the year without any recompense from man. The labour it performs in penetrating the subsoil is enormous. No other agricultural plant leaves the soil in such good physical condition as alfalfa. It prospects beneath the surface of the earth and brings her hidden treasure to the light of day. It takes the earth, air, moisture and sunshine, and transmutes them into nourishing feed stuffs and into tints of green and purple, and into nectar and sweet perfumes, alluring the busy bees to visits of reciprocity, whereon they caress the alfalfa blossoms, which, in their turn, pour out secretions of nectar fit for Jupiter to sip. It forms a partnership with the micro-organisms of the earth by which it is enabled to enrich the soil upon which it feeds. It brings gold into the farmer's purse by processes more mysterious than the alchemy of old. The farmer with a fifty-acre meadow of alfalfa will have steady, enjoyable employment from June to October, for as soon as he has finished gathering the hay at one end of the field it will be again ready for the mower at the other. The homes surrounded by fields of alfalfa have an aesthetic advantage unknown to those where the plant is not grown. The alfalfa meadow is clothed with purple and green, and exhales fragrant balmy odours throughout the growing season to be wafted by the breezes into the adjacent farmhouses."

[illegible]

FERTILISERS.

The following Fertilisers have been registered at the Department of Agriculture, under the Fertilisers Act, 1928, for the year commencing 1st November, 1930:—

FERTILISING INGREDIENTS.

Name of Fertiliser.	Firm.	Brand.	Nitrogen as			Phosphoric Acid P ₂ O ₅ as				Potash K ₂ O as		Price per ton on rails at Works or Perth.	
			Nitrate.	Ammonia.	Blood and Bone.	Bone.	Water sol.	Chtrate sol.	Acid sol.	Total.	Sulphate.		Muriate.
A.—MINERAL.													
1. Nitrogenous.													
(a) Nitrogen as Nitrate.													
Nitrate of Soda ...	Cuming, Smith-Mt. Lyell Farmers Fertilisers, Ltd.	Sickle	%	15.5	%	...	%	...	%	...	%	...	£ s. d.
Do. do. ...	do. do.	ML in diamond	...	15.5	...	...	...	...	...	...	...	...	15 4 0
Do. do. ...	do. do.	CSML	...	15.5	...	...	...	...	...	...	...	...	15 4 0
Do. do. ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	15.0	...	...	...	...	...	...	...	...	15 12 6
Nitrate of Lime ...	do. do.	do.	...	15.5	...	...	...	...	...	...	...	...	16 0 0
Do. do. ...	J. A. Newman & Co. ...	BA over SF in circle	...	15.5	...	...	...	...	...	...	...	...	16 0 0
(b) Nitrogen as Ammonia.													
Sulphate of Ammonia ...	Cuming, Smith Mt. Lyell Farmers Fertilisers, Ltd.	Sickle	...	20.5	...	...	...	...	...	...	...	...	13 0 0
Do. do. ...	do. do.	ML in diamond	...	20.5	...	...	...	...	...	...	...	...	13 0 0
Do. do. ...	do. do.	CSML	...	20.5	...	...	...	...	...	...	...	...	13 0 0
Do. do. ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	20.0	...	...	...	...	...	...	...	...	13 0 0
Do. do. ...	J. A. Newman & Co. ...	BA over SF in circle	...	20.6	...	...	...	...	...	...	...	...	13 0 0
Do. do. ...	F. Viles ...	Imperial Chemical Industries	...	20.6	...	...	...	...	...	...	...	...	13 0 0
(c) Nitrogen as Miscellaneous.													
Canitro ...	J. A. Newman & Co. ...	BA over SF in circle	20.5	...	...	...	...	...	...	...	...	...	14 15 0
Floraid ...	do. do.	do.	...	46.0	...	...	...	...	...	...	...	...	56 0 0
Urea ...	do. do.	do.	...	46.0	...	...	...	...	...	...	...	...	45 0 0
2. Phosphatic.													
(a) Rock Phosphates.													
Pacific Islands Phosphate ...	Cuming, Smith-Mt. Lyell Farmers Fertilisers, Ltd.	Sickle	...	...	...	...	...	36.65	36.65	...	...	...	4 11 6
Do. do. ...	do. do.	ML in diamond	...	...	...	...	...	36.65	36.65	...	...	...	4 11 6
Do. do. ...	do. do.	CSML	...	...	...	...	...	36.65	36.65	...	...	...	4 11 6
Phosphate Powder ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	...	...	...	...	34.80	34.80	...	...	...	4 10 0

FERTILISERS—continued.

Name of Fertiliser.	Firm.	Brand.	Nitrogen as				Phosphoric Acid P ₂ O ₅ as				Potash K ₂ O as		Price per ton on rails at Works or Perth.
			Nitrate.	Ammonia.	Blood and Bone.	Bone.	Water sol.	Citrate sol.	Acid sol.	Total.	Sulphate.	Muriate.	
FERTISING INGREDIENTS.													
A.—MINERAL—continued.													
4. NITROGEN AND PHOSPHORIC ACID.													
Ammonia and Phosphate ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	2.0	...	...	8.3	1.6	15.7	25.6	...	...	6 5 0
Ammonia and Phosphate No. 2	do. do.	do. ...	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	7 2 6
Diammonphosphate ...	J. A. Newman & Co. ...	BA over SF in circle	...	20.6	...	...	53.0	...	...	53.0	...	...	40 0 0
Fluoraphos ...	do. do.	do.	...	20.6	...	...	53.0	...	...	53.0	...	...	47 0 0
Nitrosuper ...	Cuming, Smith-Mt. Livell Farmers' Fertilisers, Ltd.	Sickle	...	1.5	...	...	16.0	.4	2.1	18.5	...	...	5 9 0
Do. ...	do. do.	do.	...	1.5	...	...	16.0	.4	2.1	18.5	...	...	5 9 0
Do. ...	do. do.	do.	...	1.5	...	...	16.0	.4	2.1	18.5	...	...	5 9 0
No. 2 Potato ...	do. do.	ML in diamond	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
No. 6 Potato ...	do. do.	ML in diamond	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
Special Potato Manure C	do. do.	Sickle	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
Special Potato Manure F	do. do.	do. ...	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
Special Potato Manure C	do. do.	do.	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
Special Potato Manure F	do. do.	do.	...	3.5	...	...	15.0	.4	1.6	17.0	...	...	6 19 0
Potato Fertiliser X ...	Binney & Son ...	do. ...	...	3.2	...	...	13.5	.4	1.6	15.5	...	...	8 9 0
Do. do. ...	do. do.	Swan	...	3.2	...	...	10.25	...	11.34	15.5	...	...	8 9 0
Do. do. ...	D. F. Carhams & Co. ...	Crown	...	3.2	...	...	10.25	...	1.09	11.34	...	...	7 7 6
5. NITROGEN AND PHOSPHORIC ACID AND POTASH.													
Mixed Manure ...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	1.5	...	...	7.1	1.4	13.5	22.0	7.5	...	7 12 6
Nitrophoska (N17.5, P ₂ O ₅ 13.0, K ₂ O 22.0)	J. A. Newman & Co. ...	BA over SF in circle	...	17.5	...	...	13.0	...	...	13.0	22.0	...	23 0 0
Nitrophoska (N15.0, P ₂ O ₅ 11.0, K ₂ O 26.5)	do. do.	do. do.	...	15.0	...	...	11.0	...	...	11.0	26.5	...	22 5 0
Nitrophoska (N15.5, P ₂ O ₅ 15.5, K ₂ O 19.0)	do. do.	do. do.	...	15.5	...	...	15.0	.5	...	15.5	19.0	...	23 0 0
Nitrophoska (N16.5, P ₂ O ₅ 16.5, K ₂ O 21.5)	do. do.	do. do.	...	16.5	...	...	16.5	...	...	16.5	21.5	...	23 0 0
No. 3 Potato ...	Cuming, Smith-Mt. Livell Farmers' Fertilisers, Ltd.	ML in diamond	...	3.75	...	...	14.5	.35	.75	15.6	4.5	...	8 1 6
No. 4 Potato ...	do. do.	do. do.	...	3.75	...	...	14.0	.3	.7	15.0	8.0	...	8 16 6
No. 7 Potato ...	do. do.	do. do.	...	3.5	...	...	10.5	.2	.6	11.3	16.0	...	10 6 6
No. 8 Potato ...	do. do.	do. do.	...	4.0	...	...	12.7	.3	.7	13.7	9.0	...	9 1 6
Orchard Manure ...	do. do.	do. do.	...	2.0	...	...	14.0	.4	1.6	16.0	5.0	...	6 19 0

2. PARTLY ORGANIC.

(a) Nitrogen and Phosphoric Acid.

Bone and Super.	...	...	Cresco Fertilisers (W.A.), Ltd.	Cresco	...	...	2.0	9.5	3.9	3.0	16.4	...	...	7 17 6
Bone and Super., No. 1	...	...	Binney & Son	...	...	...	1.37	...	...	17.65	17.65	...	...	6 10 0
Bone and Super., No. 2	...	...	do.	...	...	...	.75	...	...	11.89	11.89	...	...	5 0 0
Bone and Super., No. 1	...	...	D. F. Carbarns & Co.	...	...	...	1.37	...	...	9.65	17.65	...	...	6 10 0
Blood, Bone and Super.	...	...	Cunning, Smith Mt. Lyell Farmers' Fertilisers, Ltd.	...	...	...	2.0	13.0	.8	4.7	18.5	...	...	7 9 0
Do.	...	...	do.	...	...	...	2.0	13.0	.8	4.7	18.5	...	...	7 9 0
Do.	...	...	do.	...	...	...	2.0	13.0	.8	4.7	18.5	...	...	7 9 0
Orchard Fertiliser	...	...	Paterson & Co., Ltd.	...	...	...	5.0	...	...	12.0	12.0	...	...	12 10 0
 (b) Nitrogen, Phosphoric Acid and Potash.														
Bone, Super., Potash	...	...	Binney & Son	...	...	...	1.0	...	...	14.0	14.0	1.0	...	5 10 0
Do.	...	...	do.	...	...	...	1.0	...	...	14.0	14.0	1.0	...	5 10 0
Orchard Fertiliser (Bone), No. 2	...	...	Binney & Son	...	...	...	3.17	...	...	10.0	10.0	5.0	...	12 0 0
Special Potato (Bone), B	...	...	do.	...	...	...	3.0	...	...	15.0	15.0	2.25	...	9 10 0

* Prices not yet available.

A NEW STRAIN OF EARLY SUBTERRANEAN CLOVER.

A. B. ADAMS, B.Sc. (Agric.).

During this season a strain of subterranean clover that is new to the writer was noted on the Northam golf links.

From the evidence of observers it has been noticed to be spreading, but it was not realised that it was an early variety of a different type to any so far reported.

On whatever part of the links subterranean clover was seen, the plants were similar; it may therefore be inferred that they are all descended from one original plant.

No information is obtainable to show if subterranean clover seed were ever sown; if it were, one type only has survived; if it were not, then grazing stock were the most probable means of introducing a strain suited to the conditions.

The soil of the paddock is a heavy loam that has set down very hard and neither has been cultivated nor top-dressed for a considerable period, hence the plant has had but little encouragement.

The variety may be described as being more like the ordinary midseason variety than the early varieties previously recognised, as it has a light red calyx, lighter than that of the Daliak strain, and a light mark in the leaf which is absent from that variety. There was no means of judging its comparative size as it has been heavily stocked all season to keep the grass short, and the lack of top-dressing does not favour luxuriant growth. It was in flower from the third week in August, and if propagated is therefore likely to prove a useful pasture plant for these districts that have a rainfall similar to that of Northam.

A few of the plants were protected late in the season in the hope of obtaining information as to their seeding habits, but it proved to be too late for the purpose. Next season it is hoped to obtain further information by fencing off a few plants and fertilising them early in the season.

CAPE GOOSEBERRY (*Physalis peruviana*).

GEO. W. WICKENS,
Superintendent of Horticulture.

Suggestions have been made that Cape Gooseberries would be a profitable side line for group and other settlers in the South West, and there is no question that a ready sale is obtainable on the local markets where good quality fruit of this kind is often not available in sufficient quantities to meet the demand.

On the coastal lands where the sea influence prevents heavy frosts, fruit is produced throughout the greater portion of the year, but in the hills near Perth, and in districts further south where winter frosts are prevalent, very little fruit is harvested during the winter months.

The plants are easily propagated, seeds being sown in beds or boxes like tomatoes, in Autumn and transplanted in Spring. They must be protected from frost in the seed beds or boxes during the winter and after transplanting should be sheltered by pieces of bush until damage from frost is no longer apprehended. 7ft. x 7ft. on the square is a suitable distance apart, and an acre of land so planted will contain 889 plants.

A fair average production per plant per annum is 4 lbs. of fruit and the price in the Perth market ranges from 4d. to 8d., say an average of 6d. per lb.; so that from an acre of land a gross return of 3,556 lbs. at 6d., or £89, could be expected.

One big expense in connection with production is gathering the fruit, an average day's work for one person being 40 lbs., but where the settler is assisted by a family, boys and girls will operate as speedily and quite as effectively as adults, and the occupation, though somewhat tedious, is not laborious.

In Autumn the plants should be cut hard back and the new growths which shoot out from the crown after the advent of the seasonal rains produce fruit during the following Spring and early Summer. Profitable crops will be gathered for three to four years, after which the plantation needs renewing, and new land, that is, land on which Cape Gooseberries have not previously been grown, must be chosen for the purpose. A deep rich loamy soil, moist in summer and well drained in winter, is ideal, but where this is not available, quite successful plantations can be established on poorer land either of a gravelly or sandy nature, provided cultivation and manurial requirements receive proper attention. Liberal dressings of stable manure will give excellent results, but this is not often obtainable in sufficient quantities, and combined fertilisers that are sold as potato manures are quite suitable for Cape Gooseberries, the quantity to be applied being governed by the nature of the soil, and may range from 4 cwt. to 10 cwt. per acre, to be applied in two dressings, half in April and half in August.

The worst insect pest affecting Cape Gooseberry plants in this State is the Potato Moth and when setting out the plantation care must be taken not to place it near land on which potatoes have recently been grown, particularly where tubers affected with Moth have been allowed to remain in the ground.

If potato moths are present the method of guarding against their attack is to spray the plants with Arsenate of Lead, using $1\frac{1}{2}$ lbs. of powdered or 3 lbs. of paste in 50 gallons of water, and 1 lb. flour added to form a spreader.

This treatment is only effective before the caterpillars tunnel into leaves or stems, after tunnelling the remedy lies in cutting out and destroying the infected portions.

Red Spider and Bryobia mites are also troublesome. These can be controlled by applications of sulphur either dry or as atomic (liquid). Should the pest be present when fruit is ripening sulphur may be replaced by "Clensel"—a non-poisonous spray material which can be used for this purpose at a strength of 1 in 25.

PASTURE COMPETITION.

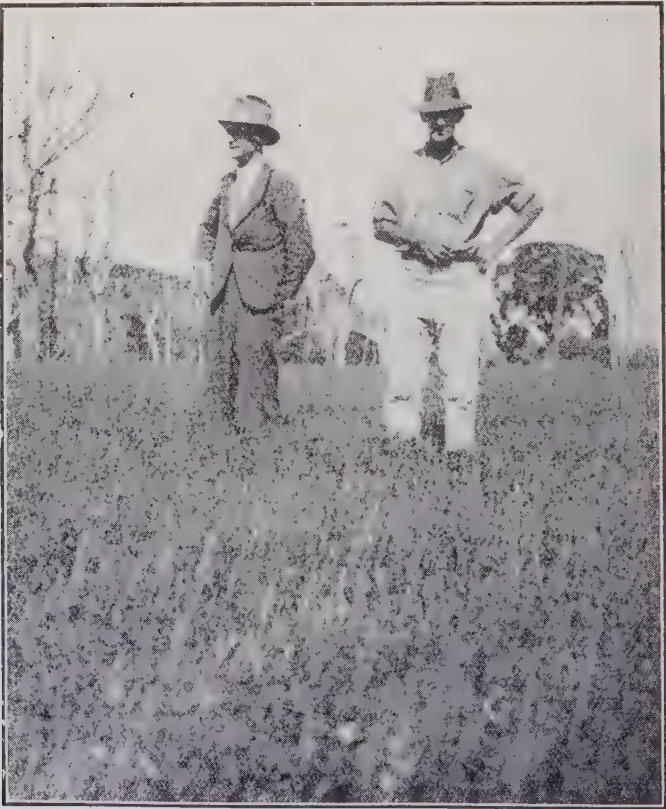
Kojonup Agricultural Society.

G. GAUNTLETT, B.Sc.(Agric.),
Agricultural Adviser.

This competition, conducted by the above Society, attracted five entrants, viz., Messrs. Cavanagh, Piesse (2), Webb, and Eulin Pastoral Company.

The following table shows the points gained by each competitor:—

Competitor.	Quality.	Yield.	Clover Content.	Freedom from Weeds.	Total.
	35	25	20	20	100
Cavanagh	33	25	19	19	96
H. Piesse (2)	32	22	18	18	90
J. Webb	31	16	18	18	83
Eulin Pastoral Company ...	30	16	17	15	78
H. Piesse (1)	29	14½	16	17	76½



Another stand.

The winning five acres was a remarkably good clover yield. The plot was very even, and consisted of a mixture of subterranean and sucking clovers with a little hop clover. The pasture was 12-15 inches high, and was practically free from weeds. The plot also was almost free from red mite.

Mr. Cavanagh's farm is at Muradup, and, as this district has an average rainfall approximately 2 inches greater than Kojonup, he had a slight advantage over the other competitors.

The pasture was top-dressed in May, and again during the first week in September, with 90 lbs. Cresco superphosphate per acre. It was grazed with sheep until the end of June, and then with cattle up to the end of September.



A good stand of Subterranean Clover grown by
Mr. H. Piesse, Kojonup.

The competitor gaining second place, Mr. H. Piesse, had a good plot of subterranean clover. This entry was also very free from weeds, but unfortunately there were a few bare patches in the plot which necessarily reduced the yield.

The other entries, while being good, had more weeds, suffered more from the attacks of the red mite, and had not made the growth of the first and second entries.

All plots were top-dressed twice.

The following table gives the estimated yields per acre of the different entries, both green material and hay:—

Plot.	Green Material.				Hay (calculated).			
	tons	cwt.	qrs.	lbs.	tons	cwt.	qrs.	lbs.
Cavanagh	10	16	0	8	2	3	0	7
H. Piesse (2)	9	10	0	16	1	18	0	3
J. Webb	6	18	1	4	1	3	2	17
Eulin Pastoral Company	6	18	1	4	1	3	2	17
H. Piesse (1)	6	5	1	8	1	5	0	7

In calculating the weight of hay I assumed that 20 lbs. of hay would be obtained from 100 lbs. green material.

Making of Clover Hay.

The best time to cut subterranean clover hay is a little after the full bloom, when the plant has had a chance to send down a good stand of seed. More often than not, clover hay is cut too late.

If carting cannot be commenced immediately, the hay should be heaped into "cocks." If carting can be proceeded with at once, the hay can be raked into wind-rows, left exposed to the sun for 12 to 24 hours, and then carted to the stack. It must be remembered that the dryer the hay, the more brittle it becomes, and a subsequent heavier loss of the leaves—the most nutritious portion—is entailed.

It is not advisable to mow the same paddock twice in succession. Subterranean clover is an annual, and a good opportunity must be given for the plant to re-seed.

In the drier portions of the State, subterranean clover hay may be made into stacks, but in the wetter portions it is probably better to cure the hay in sheds.

It is not necessary to chaff the hay; stock like it just as well long. With dairy cows, long hay would also assist in rumination.

CRANBROOK PASTURE COMPETITIONS, 1930.

Judge—A. S. WILD, B.Sc.(Agric.),
Agricultural Adviser.

This year the Cranbrook Agricultural Society conducted two pasture competitions, one for pastures established for less than 12 months and the other for those established over two years.

In the first competition only one entry, that of Mr. E. Theyer, was received, and this was accordingly awarded first prize.

Mr. Theyer's entry was on land which had been cropped once previously. The pasture had been established on fallow by broadcasting clover burr together with 50 lbs. of barley and 90 lbs. of superphosphate per acre during March, 1930. It had been grazed heavily with horses and sheep from the end of April until the middle of August. A few sheep had been depastured on the land until the middle of September.

The awards made in the second class for pastures established over two years are as follow:—

Competitor.	Yield.	Freedom from Weeds.	Useful Grasses.	Freedom from Diseases.	Evenness of Growth.	Total.
	45 pts.	15 pts.	15 pts.	15 pts.	10 pts.	100 pts.
T. R. Lewis ...	45	13	14	14	9	95
E. Theyer ...	40	12	13	14	8	87
T. H. Hall ...	35	13	14	13	8	83
D. E. Morgan ...	33	13	14	14	8	82
E. Theyer ...	33	11	13	14	7	78
H. E. Clappin ...	25	13	14	14	8	74

The rainfalls as recorded at Cranbrook during the year from April up to the 27th October are as hereunder:—

April	May	June	July	Aug.	Sept.	To Oct. 27th	Total growing period.
93	381	415	317	129	188	73	15·96 inches.

Mr. T. R. Lewis secured first place with a very good pasture plot composed almost entirely of subterranean clover. The land, which has been cleared for about six years, originally carried jarrah, red gum and white gum timber. It had been ploughed during the autumn of 1925 and sown with oats, together with 2 lbs. of subterranean clover seed per acre. Superphosphate was applied at the rate of 90 lbs. per acre, this dressing being repeated in the autumn and again in the spring of each succeeding year. This pasture had been fed off by sheep until the 1st of August. At the tie of inspection (27th October) it was calculated to yield approximately 11 tons per acre of green growth.

Mr. E. Theyer's entry, which secured second place, was on land which was cleared of its original timber (white gum and wattle) about 10 years ago. Subterranean clover seed at the rate of 2 lbs. per acre was sown during the autumn of 1928, after the land had been disc-cultivated. At the time of sowing, superphosphate was applied at the rate of 60 lbs. per acre, this being followed by a dressing of 90 lbs. per acre in 1929 and another of 60 lbs. per acre during July, 1930. This plot, which was calculated to yield approximately 9 tons per acre, had been heavily stocked up to July of this year.

Mr. T. H. Hall's pasture was on jarrah and white gum country. This land had been fallowed with a mouldboard plough during 1926, and, in the following March, sown with one bag of subterranean clover burr and 2 lbs. of rape per acre, together with 112 lbs. of superphosphate. Each year an autumn top-dressing of 90 lbs. per acre of superphosphate was applied. In the autumn of 1928 yellow suckling clover and drooping flowered clover were sown at the rate of 2 lbs. per acre with the superphosphate. An additional 90 lbs. of this fertiliser was also applied to each acre during the spring of this year. The plot had been heavily fed off with stock up to the end of August.

The pasture entered by D. E. Morgan, on open white gum country, had been established about four or five years. Two lbs. of subterranean clover and $\frac{1}{2}$ lb. of Wimmera rye grass were sown on fallowed land together with 90 lbs of superphosphate per acre. Each autumn the pasture has been top-dressed with 45 lbs. of

superphosphate per acre, and an additional 45 lbs. per acre was applied during the spring of this year. The pasture had been grazed until the middle of August.

Mr. E. Theyer's second entry had been prepared in a similar manner.

Mr. H. E. Clappin's pasture was on yate and flooded gum country. It had been harrowed and top-dressed with 90 lbs. of superphosphate per acre during March, 1930.

WEST ARTHUR PASTURE COMPETITION, 1930.

Judge A. S. WILD, B.Sc.(Agric.),
Agricultural Adviser.

This competition was held under the auspices of the West Arthur Agricultural Society. The competing pastures were inspected on the 22nd October. The monthly rainfalls for 1930, up to that date, as registered at Darkan, are given below:—

Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.
<i>Nil</i>	25	48	125	217	653	770	214	243

Awards were made as follows:—

Competitor.	Yield. 45 pts.	Freedom from Weeds. 15 pts.	Useful Grasses. 15 pts.	Freedom from Disease. 15 pts.	Evenness of Growth. 10 pts.	Total. 100 pts.
E. L. Walker ...	40	13	12	13	9	87
A. C. Cummings ...	38	13	12	13	8	84
H. C. Pobjoy ...	30	13	12	11	7	73

Mr. E. L. Walker's winning pasture plot was on a sandy Wandoo flat with clay subsoil. The land had been cleared seven or eight years previously. This pasture was established about six years ago after a crop of Sudan grass. Subterranean clover seed was planted on the ploughed land at the rate of 5 lbs. per acre, superphosphate being applied at the rate of 90 lbs. per acre. This dressing of fertiliser has been repeated during the April of each succeeding year. In addition, the plot received a further top-dressing of 90 lbs. of superphosphate per acre during the spring of 1929, and one of 60 lbs. per acre during the spring of 1930.

Mr. A. C. Cumming's pasture was also on a Wandoo flat, being on land which had been re-cleared four years ago. This pasture was established by sowing $\frac{3}{4}$ lb. of subterranean clover with 90 lbs. of superphosphate per acre on land which had previously been skim-ploughed. During the autumn of 1928 it was top-dressed with superphosphate at the rate of 80 lbs. per acre, followed by further dressings of 120 lbs. in 1929 and 60 lbs. in 1930. Immediately after the last top-dressing the land was scarified.

Mr. H. C. Pobjoy's entry was a pasture established on a red gum flat. It had been established six years previously by sowing $\frac{1}{2}$ lb. of subterranean clover per acre under cover of oats and rape. During the autumn of each subsequent year it was top-dressed at the rate of 80 lbs. of superphosphate per acre. Additional top-dressings were also applied during the spring in 1929 and 1930.

THE NEW BEES ACT.

H. WILLOUGHBY LANCE,
Apiculturist.

After many years of effort by the Beekeepers' Association, a new Act dealing with the control of Apiaries has passed through Parliament and will come into effect shortly. It may be well to briefly describe here how it will affect the industry.

The objects of the Act are to improve the industry, also to protect the commercial apiarists against the careless or ignorant beekeeper. Unfortunately there are a number of persons who like to see a hive of bees on their premises, but have no knowledge of how to handle them or of any disease that may attack them. There are many infectious diseases which attack bees and the most serious of these are dealt with in the Act.

"Apiary."—The Act provides that an apiary includes any place where bees or appliances are kept. This of course means that if one hive of bees is kept, the beekeeper will come under the Act. Also, if there are any appliances such as old unused hives, these will also come under the Act, the reason being that one hive may become diseased or the old empty hives may have become empty on account of disease and it may be necessary to inspect these.

"Beekeeper"—means any person who keeps bees or the person in charge of bees or a person who allows bees to be kept on any land occupied by him, or who is the owner of or has in his possession or allows to be kept on any land owned or occupied by him any appliances that have been used in connection with apiculture. This definition has the same object in view as the first, namely, to bring under the purview of the Department of Agriculture all places where bees or appliances of any description are kept. If the owner of any land allows a person to place bees thereon, he is responsible either to see that that beekeeper registers the apiary site or to do so himself.

Registration.—The registration of every beekeeper is provided for. The registration fee has been fixed at 1s. for 10 hives or less, and 2s. 6d. for over 10 hives. Application for registration to be made to the Director of Agriculture. Penalty for non-compliance, £5.

Disease.—It is obligatory for any beekeeper who discovers disease amongst his bees to immediately notify the Department of Agriculture, and to take steps to cure or eradicate the disease. It is also an offence for any person who has infected bees or appliance, to sell, barter, give away or otherwise dispose of them in such a manner as shall be prescribed.

The Act gives power to an officer of the Department of Agriculture to enter and inspect any apiary, bees, appliances, etc., and exonerates him from being deemed a trespasser or made liable for any damage, unless such damage is occasioned wilfully and without necessity. If it becomes necessary to have any bees, hives, etc., destroyed, the owner cannot claim any compensation in respect to any damage that may result to him therefrom unless the destruction was occasioned wilfully and without necessity.

The powers of an officer to deal with disease are also defined, and he has the power, if necessary, to have any bees or hives destroyed within a specified time. Should the beekeeper fail to carry out these instructions the Department of Agriculture, with the approval of the Director, may carry out the work at the beekeeper's expense.

Proclamations.—Any area that becomes seriously infected with diseases may be declared an infected area, in which case bounds will be set to that area from which no bees or appliances may be removed. Also any district may be proclaimed a district in which only a specified type of hive may be used.

Hives.—The Act deals with hives which are in such a condition that the combs cannot be separately and readily removed from the hive for examination without cutting the comb, and includes not only box hives in which the combs are attached to the box by the bees, but also frame hives which have cross combs or badly built combs so that each separate comb cannot be removed without cutting. It also covers broken and ant-eaten hives which are in such a condition that they cannot be handled for inspection. It gives the officer power to have the bees removed from these hives within a specified time and placed in satisfactory hives.

The greater and lesser Wax Moth are also dealt with, and an officer has power to have any bees or hives infected with these pests disinfected or destroyed as may be necessary.

Importations.—An important clause is one that is designed to prevent the bringing into the State of any infectious material. Although we have Foul Brood disease in Western Australia at the present time, there are only a few districts which are affected, and so far as is known at present, there is no Acarine Disease. This clause provides that—

“No person shall introduce into the State, either by land, sea, or air, any bees, hives, honey, or beekeepers’ appliances that have been used in connection with beekeeping, unless accompanied by a certificate in writing as prescribed from a Government apiculturist or the Department of Agriculture in the country or State of origin, certifying that such bees, hives, honey or appliances come from a district in which Foul Brood (*Bacillus larvae*, *Bacillus pluton*, or *Bacillus alvei*), and Isle of Wight Disease (Acarine Disease), do not exist.”

It must be noted that in this clause any bees, hives or appliances that have been used for beekeeping must be accompanied by a certificate of cleanliness before they can be introduced into the State.

Honey is also included in this clause and it means that no honey may be imported into Western Australia from a district in which Foul Brood exists. As most beekeepers are aware, honey is a great carrier of the spores of Foul Brood, and there is no doubt in the minds of leading scientists and beekeepers that this foul disease is spread by the passage of honey from one district to another. Very often empty containers are thrown out and cleaned up by the bees, and if the honey comes from a diseased hive the spores causing the disease are carried into the hives and may easily start a serious epidemic. There are many districts in this State in which Foul Brood is not at present known to exist, and the object of this clause is to prevent infected honey being brought into the State, the empty containers of which might be thrown out in clean districts. It may here be noted that the French Ministry of Agriculture has just promulgated an order that the importation of bees, etc., is only permitted if accompanied by a certificate of good health. This applies also to honey.

Penalties.—It will be an offence for any person to obstruct or impede an officer in the execution of his powers under this Act; or to fail to comply with the provisions of the Act, or to furnish such information as may be necessary, the penalty being Twenty pounds.

Power is also given to the Department of Agriculture to carry out any necessary work which the beekeeper fails to do, at the expense of the beekeeper, and provides for the recovery of such expenses in a court of law.

Regulations may be made for the carrying out of the Act and for the inspection of honey houses, etc.

As regards diseases, there are many beekeepers that have had no experience with these, who should make themselves acquainted with the symptoms. An article on Bee Diseases appeared in the "Agricultural Journal" for March, 1929, which has been reprinted in leaflet form, a copy of which may be obtained on application.

TOBACCO INVESTIGATIONS, 1929-30.

[The following article is an extract from the Annual Report of the Officer in Charge of Irrigation (Mr. A. R. C. Clifton) and refers to the progress of the work conducted co-operatively by the W.A. Department of Agriculture and the Australian Tobacco Investigation. The field work in connection with the tests reported on was carried out by Mr. H. J. Limmer on his property at Manjimup.—Ed.]

The work undertaken during 1929-30 comprised the following:—

Project No. 3: Seeding Tests to determine the best date for sowing seed beds.

Projects 5 and 8: Seasonal Variety Trial, to determine the most favourable date for transplanting in the field and to determine which of the flue-cured varieties are best adapted to West Australian conditions.

Project 23: Production of disease-free seed.

Project 24: Fertiliser Trial.

Project No. 3.

Seed beds were planted on the following dates:—

No. 1	...	8th July	...	Under glass
„ 2	...	18th July	...	do.
„ 2A	...	1st August	...	do.
„ 3	...	19th August	...	do.
„ 4	...	31st August	...	do.
„ 5	...	6th Sept.	...	do.
„ 6	...	23rd Sept.	...	do.
„ 7	...	25th Sept.	...	calico covered
„ 8	...	11th Oct.	...	do.
„ 9	...	11th Oct.	...	do.

comprising in all 85 sq. yards.

The heating material used in No. 1 seed bed was green manure. This was not satisfactory, and stable manure, which was found to give a temperature of from 5° to 10° higher, was used in No. 2 and subsequent beds up to the middle of September.

On account of the failure of No. 1 seed bed to germinate and come away quickly, No. 2 seed bed had to be relied on for the first planting, which was planned to commence in the beginning of September.

To get the plant along in time it was therefore decided to endeavour to prevent the drop of the night temperature in this seed bed by placing under the glass frame and across the surface of the bed a length of 2in. galvanised iron down piping through which hot air was circulated every night from an oil lamp outside the frame, somewhat on the principle of the flue in a curing barn. Mr. Limmer, in the latter part of winter, was thus able to have plants in the field seven weeks after sowing in the seed bed.

The seed-bed results are shown in the following table:—

Seed-bed.	Date Sown.	Type.	Soil.	Date Germinated.	Date ready to Plant out.
No.					
1	8 July	Hot bed under glass	Black sand	25 July (17 days)	21 Sept. (75 days)
2	18 July	do. do.	do.	25 July (7 days)	5 Sept. (49 days)
2A	1 Aug.	do. do.	do.	10 Aug. (9 days)	30 Sept. (60 days)
3	19 Aug.	do. do.	do.	28 Aug. (9 days)	16 Oct. (58 days)
4	31 Aug.	do. do.	do.	9 Sept. (9 days)	1 Nov. (61 days)
5	6 Sept.	Calico covered, 16th glass covered	do.	21 Sept. (15 days)	9 Nov. (64 days)
6	23 Sept.	Cold frame under glass	do.	4 Oct. (11 days)	19 Nov. (57 days)
7	25 Sept.	Cold frame, calico covered	do.	4 Oct. (9 days)	19 Nov. (55 days)
8	11 Oct.	do. do.	do.	21 Oct. (10 days)	1 Dec. (51 days)
9	11 Oct.	do. do.	do.	21 Oct. (10 days)	1 Dec. (51 days)

Projects 5 and 8.

This test was carried out on well-drained light sandy loam, having a gentle slope with an easterly aspect (karri and redgum country).

Portion of the area was used for the previous season's tobacco trial, but the larger portion (plots 1 to 140) had been down in subterranean clover for several years.

At the end of July the land was ploughed 8 inches deep and left in the rough until the end of August, when it was cross-ploughed and disc-cultivated.

The fertiliser used was as follows:—

100 lbs. Sulphate of Ammonia.

50 lbs. Nitrate of Soda.

600 lbs. Superphosphate.

100 lbs. Sulphate of Potash.

and was applied by hand at the rate of 1,000 lbs. per acre along an open furrow and then covered with a plow from each side and levelled off.

One-hundredth acre plots were laid out in single rows 42 inches apart; each plot contained 75 plants, which were set at 20-inch intervals in the row.

Planting in the field was carried out at fortnightly intervals, as follows:—

1st planting	..	..	..	5th September.
2nd planting	..	..	..	18th September.
3rd planting	..	..	..	2nd October.
4th planting	..	..	..	16th October.
5th planting	..	..	..	30th October.
6th planting	..	..	..	13th November.
7th planting	..	..	..	27th November.
8th planting	..	..	..	11th December.

The varieties intended to be used for each planting (in triplicate) were Hickory Pryor, Warne, Adcock, Conqueror and White Stem Orinoco, with Dungowan as control. Unfortunately, however, the Conqueror plants were not ready until the second planting on the 18th September, and White Stem Orinoco was not ready until the third planting on the 2nd October.

The average yield per acre and percentage of bright leaf of all plots in each planting were as follow:—

First planting	...	Sept. 5th	...	1,521lbs. cured leaf	...	57·7 per cent. bright.
Second planting	...	Sept. 18th	...	1,322 „ „ „	...	66·2 „ „
Third planting	...	Oct. 2nd	...	1,165 „ „ „	...	57·3 „ „
Fourth planting	...	Oct. 16th	...	1,186 „ „ „	...	63·8 „ „
Fifth planting	...	Oct. 30th	...	1,069 „ „ „	...	54·3 „ „
Sixth planting	...	Nov. 13th	...	521 „ „ „	...	1·0 „ „
Seventh planting	...	Nov. 27th	...	498 „ „ „	...	0·0 „ „
Eighth planting	...	Dec. 11th	...	532 „ „ „	...	3·6 „ „

It will be noted that excellent yields were obtained up to the fifth planting on 30th October, while the yields of the last three plantings were 50 per cent. less. This is accounted for by the dry weather and difficulty of getting the plants to strike, resulting in a large percentage of misses.

The absence of bright leaf in the later plantings would be due to the poor growth and the necessity for having to plant harvest a large amount of immature leaf on account of field fire and the risk of heavy rain due to the lateness of the season.

The following table shows the percentages of bright leaf and yield of each variety in the first five plantings, and is a truer indication of the bright leaf procurable:—

Variety.	No. times in expt.	Yield.	Bright.	Dark.
		per cent.	per cent.	per cent.
Hickory Pryor	15	94·9	73	27
White Stem Orinoco	9	94·8	72·9	27·1
Adcock	15	95·2	67·4	32·5
Conqueror	12	84·3	70·9	29·1
Warne	15	96·5	53	47
Dungowan (Control)	42	100	29·2	70·8

Full details of the plot yields will be found set out in Table No. 1, and the percentages of bright leaf and yield of the different varieties are set out in Table No. 2.

Project No. 23—Production of disease-free seed.

Three-quarters of an acre of tobacco comprising the following 16 varieties:—

Warne	Flannagan
Hickory Pryor	Hester
Conqueror	Big Orinoco
White Stem Orinoco	Little Orinoco
Adcock	Lizzard Tail
Yellow Pryor	Gold Leaf
Cash	Dungowan
Long Leaf Gooch	Spotted Gum

were grown for the seed requirement of the Australian Tobacco Investigation. 42¾ lbs. of cleaned, graded and tested seeds were forwarded to Melbourne.

The decision to have a special seed plot was arranged after plans had been made for the season's operations, and unfortunately the only land available for this purpose turned out to be too wet on account of the wet November to get on to until December, and consequently the seed plants were late in reaching maturity.

In future, seed plants will be put out early in the season to avoid the harvesting of the seed, etc., clashing with the grading and sorting of the leaf.

Project No. 24—Fertiliser Trial.

Ten one-hundredth acre plots of Spotted Gum were planted on 25th October. Five of these plots had the complete fertiliser, while the balance had the same amounts of superphosphate and potash, but no nitrogen.

The results were as follow:—

Complete Fertiliser.

Yield per acre Cured Leaf.	Bright.	Dark.
880 lbs. \ ...	per cent. 30	per cent. 70

Non-nitrogenous Fertiliser.

Yield per acre Cured Leaf.	Bright.	Dark.
790 lbs. 	per cent. 29·74	per cent. 70·26

The absence of nitrogen appeared to make no difference to the percentage of bright leaf, but decreased the total yield by 90 lbs. per acre as compared with the plots treated with the complete fertiliser. It was noted, however, that the nitrogen plots were more subject to field fire than the others. The top end of all these plots made very poor growth on account of the land drying out, so that the test was not a satisfactory one. Spotted Gum is a similar variety to Dungowan, and the percentage of bright leaf would have been much higher had a more suitable variety such as Hickory Pryor or White Stem Orinoco been used.

General.

The outstanding features of this year's tobacco experiments were the splendid results of the early plantings.

In this connection, however, it is necessary to draw attention to the unusually favourable distribution of the rainfall up to the end of December, which undoubtedly would have a large bearing on the heavy yields obtained.

September and August at Manjimup are very often wet and cold months, and would not be good growing weather for tobacco. This season, however, the rainfall was below the average for these two months, so that the soil conditions in September were more favourable than they would be normally.

The October rainfall was below the average, but the rainfalls for November and December were 247 and 121 points, respectively, above average.

The rainfall, on the other hand, fell away after December and was well below the average for the rest of the growing period, which would account for the falling-off of the yields of the later planted plots.

The Manjimup rainfall data is set out below:—

Year.	Month.	Rainfall.	Average (14 years).
1929	August	451	632—181 points below average.
"	September	300	502—202 " " "
"	October	294	380—86 " " "
"	November	423	176—247 points above average.
"	December	221	100—121 " " "
1930	January	19	104—95 points below average.
"	February	19	120—101 " " "
"	March	107	126—19 " " "
"	April	153	256—103 " " "

The foregoing indicates the importance of continuing these tobacco trials and collecting data over a number of seasons.

Another interesting feature was the large percentage of bright leaf obtained from the heavy yields on old clover land. It would seem as if the Manjimup land does not have too much nitrogen for the production of bright leaf. The results of the tests of the smoking and general qualities of the leaf, however, may throw further light on this point.

The best varieties for amount of bright leaf produced were Hickory Pryor, White Stem Orinoco and Adcock.

It was unfortunate that White Stem Orinoco was not included in the first two plantings. The possibilities of this variety are indicated, however, in the fifth planting, where 91 per cent. of bright leaf was obtained.

The leaf has all been despatched to Melbourne, where it will be aged and smoking tests will be carried out under the personal supervision of Mr. C. M. Slagg, the Director of the Australian Tobacco Investigation.

TABLE NO. 1—PROJECT NO. 5 AND 8.
Seasonal Variety Test—1/100 acre Plots, Control—"Dungowan."
MANJIMUP.

Sec- tion.	Plot No.	Variety: Dun- gowan.	Plot No.	Variety: Hickory Pryor.	Plot No.	Variety: Warne.	Plot No.	Variety: Dun- gowan.	Plot No.	Variety: Adcock.	Plot No.	Variety: Con- queror.	Plot No.	Variety: Dun- gowan.	Plot No.	Variety: White Steam Orinoco.	Plot Totals.	Plot Means.
First Planting—5th September.																		
1	1	lbs.	1,950	2	lbs.	1,600	4	lbs.	1,925	5	lbs.	1,575	...	lbs.	1,925	...	lbs.	1,710
2	61	2,000	63	1,550	63	1,100	64	1,525	65	1,375	...	...	...	...	...	...	8,550	1,710
3	121	1,500	123	1,300	123	1,325	124	1,350	125	1,250	...	...	...	...	...	...	7,550	1,510
Sum ...	...	5,450	...	4,350	...	4,025	...	4,800	...	4,200	...	...	...	...	...	...	6,725	1,345
Mean ...	...	1,816	...	1,450	...	1,341	...	1,600	...	1,400	...	...	...	...	...	...	...	4,565
Per cent.	...	100	...	79.8	...	83.8	...	100	...	87.5	...	...	...	...	...	...	...	1,521
Second Planting—18th September.																		
1	6	1,700	7	1,400	8	1,275	9	1,800	10	1,475	11	1,000	12	1,225	...	...	9,875	1,410
2	68	1,150	67	1,500	68	1,600	69	1,175	70	1,400	71	1,375	72	1,600	...	...	9,800	1,400
3	128	1,150	127	1,125	128	1,175	129	1,275	130	1,175	131	1,100	132	1,075	...	...	8,095	1,156
Sum ...	...	4,000	...	4,025	...	4,050	...	4,250	...	4,050	...	3,475	...	3,900	...	...	...	3,906
Mean ...	...	1,333	...	1,341	...	1,350	...	1,416	...	1,350	...	1,158	...	1,300	...	...	...	1,322
Per cent.	...	100	...	100.6	...	95.3	...	100	...	95.3	...	89.00	...	100	...	...	...	...
Third Planting—2nd October.																		
1	13	1,925	14	1,350	15	1,075	16	1,400	17	925	18	1,050	19	1,575	20	1,150	10,150	1,268
2	73	1,375	74	1,800	75	1,225	76	1,300	77	1,275	78	1,100	79	1,300	80	1,050	10,125	1,265
3	133	750	134	900	135	800	136	1,225	137	975	138	950	139	1,150	140	950	7,700	962
Sum ...	...	3,750	...	3,550	...	3,100	...	3,925	...	3,175	...	3,100	...	4,225	...	3,150	...	3,495
Mean ...	...	1,250	...	1,183	...	1,033	...	1,308	...	1,058	...	1,033	...	1,408	...	1,050	...	1,165
Per cent.	...	100	...	94.6	...	79	...	100	...	80.8	...	73.3	...	100	...	74.5	...	...

Fourth Planting—16th October.

1	21	1,300	22	1,125	23	1,500	24	1,150	25	1,500	26	1,000	27	1,275	28	1,700	10,550	1,318
2	81	1,075	82	1,125	83	1,125	84	1,150	85	1,150	86	1,025	87	1,150	88	925	8,625	1,078
3	141	825	142	1,000	143	1,050	144	1,200	145	1,225	146	1,250	147	1,375	148	1,375	9,300	1,162
Sum ...	...	3,200	...	3,250	...	3,675	...	3,600	...	3,875	...	3,275	...	3,700	...	4,000	...	3,558
Mean ...	...	1,066	...	1,083	...	1,225	...	1,166	...	1,291	...	1,091	...	1,233	...	1,338	...	1,186
Per cent.	...	100	...	101.5	...	105	...	100	...	110.7	...	88.4	...	100	...	108	...	...

Fifth Planting—30th October.

1	29	1,300	30	1,050	31	1,000	32	975	33	825	34	1,000	35	1,400	36	1,375	8,925	1,115
2	89	850	90	950	91	850	92	500	93	900	94	925	95	1,000	96	1,050	7,025	1,178
3	149	1,175	150	1,175	151	1,000	152	1,325	153	1,125	154	1,275	155	1,300	156	1,350	9,725	1,215
Sum ...	...	3,325	...	3,175	...	2,850	...	2,800	...	2,850	...	3,200	...	3,700	...	3,775	...	3,208
Mean ...	...	1,108	...	1,058	...	950	...	933	...	950	...	1,066	...	1,233	...	1,258	...	1,069
Per cent.	...	100	...	98.4	...	101.8	...	100	...	101.8	...	86.4	...	100	...	102	...	...

Sixth Planting—13th November.

1	37	625	38	500	39	475	40	750	41	375	42	500	43	625	44	625	4,475	559
2	97	525	98	475	99	450	100	525	101	375	102	475	103	400	104	500	3,350	477
3	157	450	158	500	159	700	160	350	161	525	162	675	163	650	164	375	4,225	528
Sum ...	...	1,600	...	1,475	...	1,625	...	1,625	...	900	...	1,650	...	1,675	...	1,500	...	1,565
Mean ...	...	533	...	491	...	541	...	541	...	450	...	550	...	558	...	500	...	521
Per cent.	...	100	...	92	...	100	...	100	...	83	...	98.5	...	100	...	89.6	...	...

Seventh Planting—27th November.

1	45	825	46	525	47	500	48	725	49	525	50	575	51	600	52	450	4,725	590
2	105	550	106	450	107	350	108	550	109	350	110	325	111	525	112	275	3,175	396
3	165	525	166	450	167	475	168	650	169	575	170	325	171	700	172	375	4,075	509
Sum ...	...	1,900	...	1,325	...	1,225	...	1,925	...	1,450	...	1,225	...	1,825	...	1,100	...	1,495
Mean ...	...	633	...	441	...	408	...	641	...	483	...	408	...	608	...	366	...	498
Per cent.	...	100	...	69.6	...	63.6	...	100	...	75.3	...	67	...	100	...	60.1	...	...

Eighth Planting—11th December.

1	53	900	54	550	55	725	56	875	57	700	58	525	59	700	60	525	5,500	686
2	113	450	114	400	115	375	116	375	117	275	118	325	119	500	120	200	2,900	362
3	173	625	174	450	175	650	176	575	177	425	178	450	179	650	180	575	4,400	550
Sum ...	...	1,975	...	1,400	...	1,750	...	1,825	...	1,400	...	1,300	...	1,850	...	1,300	...	1,598
Mean ...	...	658	...	466	...	583	...	608	...	466	...	433	...	618	...	433	...	532
Per cent.	...	100	...	70.8	...	95.8	...	100	...	76.6	...	70	...	100	...	70	...	...

The figures in the variety column are the yields per acre in pounds of cured leaf.

TABLE No. 2.—PROJECT 5 AND 8.

Percentages of Yield and Bright Leaf.

Date of Planting.	Hickory Pryor.		White Stem. Orinoco.		Adeock.		Conqueror.		Warne.		Dungowan (Control).		Bright.	
	Yield.	Bright (Lemon and Orange).	Yield.	Bright (Lemon and Orange).	Yield.	Bright (Lemon and Orange).	Yield.	Bright (Lemon and Orange).	Yield.	Bright (Lemon and Orange).	Yield.	Bright (Lemon and Orange).	Sum.	Mean.
	%	%	%	%	%	%	%	%	%	%	%	%		%
Sept 5	79.8	73	...	...	87.5	70	...	...	83.8	46	100	42	231	57.7
Sept. 18	100.6	79	...	...	95.3	67	89	68	95.3	68	100	49	331	66.2
Oct. 2	94.6	81	74.5	54	80.8	67	73.3	60	79	46	100	36	344	57.3
Oct. 16	101.5	80	108	74	110.7	70	88.4	83	105	67	100	9	383	63.8
Oct. 30	98.4	53	102	91	101.8	61	86.4	73	101.8	38	100	10	326	54.3
Nov. 13	92.0	0	89.6	0	83	6	98.5	0	100	0	100	0	6	1
Nov. 27	69.6	0	60.1	0	75.3	0	67	0	63.6	0	100	0	0	0
Dec. 11	70.8	7	70	15	76.6	0	70	0	95.8	0	100	0	22	3.6
Sum ...	707.3	373	504.2	234	711.0	341	572.6	284	724.3	265	800	146	...	...
Mean ...	88.4	46.6	84	39	88.8	42.6	81.8	40.5	90.5	33.1	100	18.2	...	...

ROOT NODULES ON LUPINS.

An apparent difference in the type of bacteria needed for different varieties of Lupins grown at Muresk College.

A. B. ADAMS and J. H. RICHES.

In the September, 1929, issue of this Journal it was shown that at Merredin it was necessary to inoculate Lupins with their own strain of nodule producing organism if vigorous growth was desired.

The writers have noted that of three different varieties of Lupins growing on adjoining plots at the College, the Western Australian variety (*Lupinus pilosus*) has made vigorous growth and has set a satisfactory amount of seed whereas the imported varieties (*L. angustifolius* and *L. Merchels Liebueher*) have made spindly growth and set very little seed.

On examining the plants the roots of the first variety were found to be well supplied with root nodules and the roots of the other two varieties were not infected at all.

As the plots are adjoining, with only a foot path between them, and as none of them were inoculated, it is tentatively suggested that the Western Australian variety has adapted itself to the type of bacteria found in local soils but the imported varieties are dependent on a special race of the root organism.

THE COOLING OF MILK AND CREAM.

C. K. BARON-HAY,

Superintendent of Dairying.

Six years ago (Journal of Agriculture, June 1924), the writer drew the attention of dairy farmers to the large percentage of second grade cream then being received at factories during the summer months of the year, the peak being reached in February and March, when as much as 12 per cent. of all the cream received was second grade.

It is pleasing to be able to write that the position is much better to-day, but the opinion is held that this improvement is due to the great increase in production in the cooler portions of the State, and the less production in such areas as along the Great Southern, rather than to any great improvement in the method of handling.

Three factors operating to-day call for a timely warning to dairy farmers of the serious losses that may occur through the production of second grade cream :—

1. Keen competition of margarine (containing vegetable fats) with all but choice grades of butter. This has caused a serious difficulty in the disposal of second grade butter, except at extremely low prices.
2. The falling price of butter fat means a greater percentage loss to the dairy farmer through second grade cream, than when the price is relatively high

Assuming second grade cream is worth 5d. per lb. less than first grade, with a similar fat content, then the loss to the farmer when butter fat is 1s. 6d. per lb. is 27·7 per cent. ; when, however, butter fat has fallen to 1s. 1½d. per lb., the loss to the farmer is 37 per cent.

3. Owing to present economic conditions, many farmers in comparatively dry, warm districts, are now endeavouring to produce cream for delivery to a factory.

The general farm practice necessary to produce first grade cream is detailed in Bulletin No. 180, "Care of Milk and Cream," issued free by the Department.

It is intended here, however, to deal with one important factor in this direction, namely, *cooling*.

The importance of reducing the temperature of cream *as quickly as possible* during the summer months cannot be over-estimated, and although a great reduction is difficult without artificial means, the reduction of the temperature by only a few degrees is most beneficial.

Cream separated on a warm day commonly records a temperature of over 90° Fah., and, unless some means are taken to lower this temperature rapidly, may remain so for some considerable time. At this temperature bacterial action is most rapid, and unfortunately the temperature is such as to stimulate the undesirable putrefactive and gas producing (fermenty creams) bacteria, at the expense of the desirable lactic acid producing bacteria, which thrive at approximately 60–70° Fah.

Cooling may be carried out in a variety of ways, dependent on the natural facilities of each farm :—

1. By allowing cream to flow over a water-cooled surface. See Fig. I.

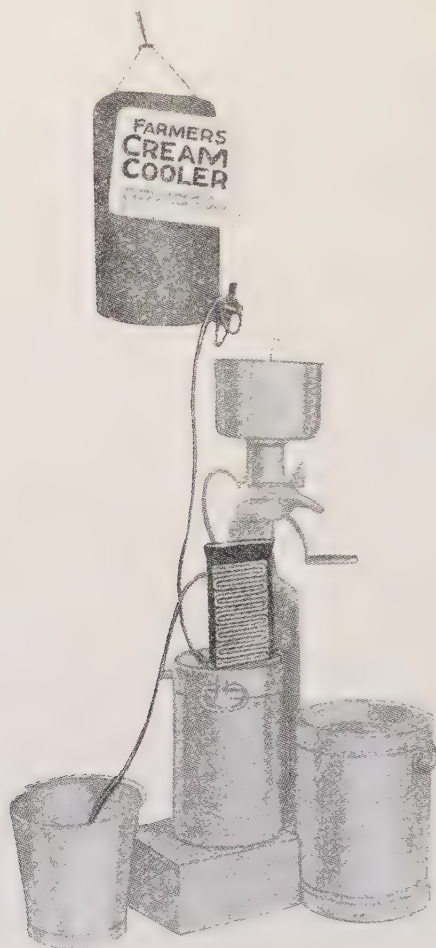


Fig. I.

The temperature to which the milk or cream can be reduced will depend up on the temperature of the water available, the quantity passing through the cooler, and the speed of the cream passing over the cooler.

The longer the cream can be kept in contact with the cooler, the more closely will its temperature compare with the cooling water.

The cream as it leaves the cooler should nor be more than 2° Fah. warmer than the water entering the cooler.

After separation, cream of course should be kept in as cool a place as possible. Covering the can with a white cloth, kept damp, is a good practice. Cream may *rapidly* be cooled 30°–40° Fah. by this method.

2. By standing cream can in a tank containing cold water, preferably running.

Water conducts heat approximately 21 times as fast as air. This means that, by surrounding the cream can with water, the cream will be cooled 21 times faster than by standing in air at the same temperature.

The tank used for cooling the cream should be deep enough to allow the water to cover the cans up to the top of the cream.

When separating, two cans should always be available, as *warm cream should never be run into the cold cream from previous separation.*

Where running water is available, the cooling tank may be placed between the source of supply and a trough, to obviate the waste of water. See Fig. II.

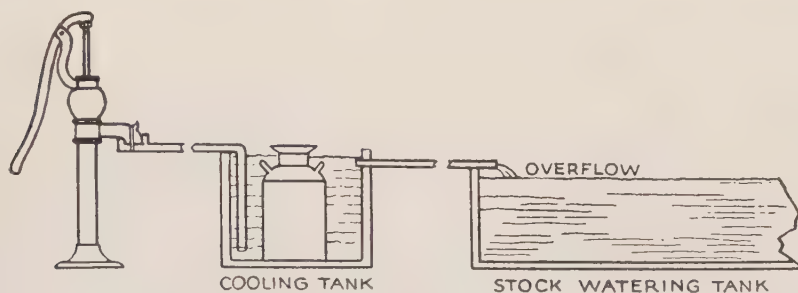


Fig. II.

3. By the use of a cooler of the Coolgardie Type. See Fig. III.

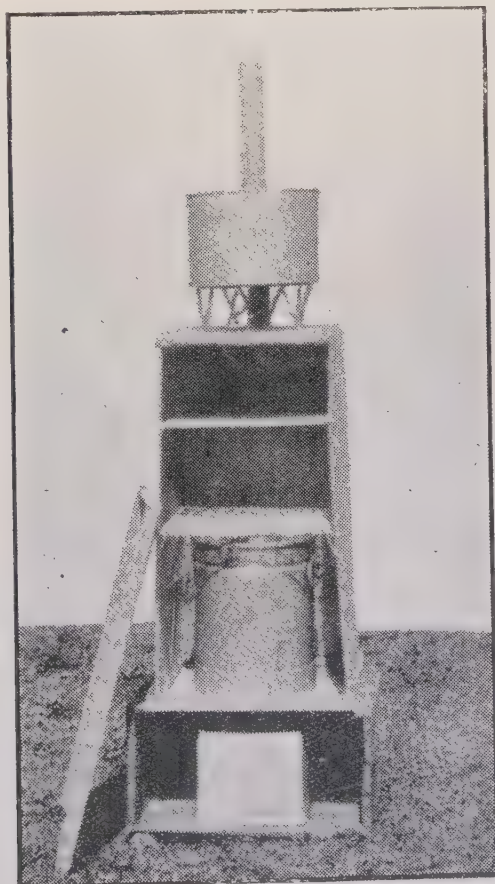


Fig. III.

This particular type of cooler is most valuable in maintaining a low temperature, but does not reduce the temperature as rapidly after separation as do the other methods.

The Coolgardie Cooler, however, is of great value in keeping temperatures down in those areas where the water supply is precarious.

Points in connection with these coolers are :—

- (i.) The framework should be of metal, as wood absorbs water, becomes infected with bacteria in time, and often grows moulds.
- (ii.) Cooling depends on the evaporation of water, and to be effective the cooling surface, usually hessian, must be continually moist.
- (iii.) Some device for permitting a constant flow of water, other than flannel strips, is desirable.
- (iv.) Care must be exercised to see that the hessian is changed once a season as it is liable to become mould-carrying during the winter months when out of use.
- (v.) Ventilation allowing a constant stream of fresh air is essential, otherwise cream will develop musty flavour mentioned below.

The practice of some farms of placing the warm cream in a closed cellar to there cool is to be deprecated, as cooling is necessarily slower than in an atmosphere where the air is flowing. Moreover, a peculiar smothered or musty flavour commonly occurs, which may be imparted to the butter.

In closing, it is well to remember that butter factories to which cream is delivered are operating under strict supervision, as regards their methods of manufacture, and it is only reasonable for the producer to take every step at his end to supply a choice cream for the manufacture of a choice butter.

THE BANANA IN WESTERN AUSTRALIA.

F. J. S. WISE,
Tropical Adviser.

THE BANANA AS A FOOD.

In his excellent official work, "What America can teach us," Mr. W. Ranger, of the Committee of Direction of Fruit Marketing, says in reference to the food value of the banana:—

"The banana is one of the most important carbohydrate foods, and is a good source of two of the other four food elements required by the body, that is, mineral salts and vitamins. The banana heads the list of fresh fruits and surpasses most of the vegetables in food value. Attention is drawn to the fact that the banana is used in the treatment of celiac disease (chronic intestinal indigestion), one of the most troublesome disturbances of nutrition in late infancy and early childhood. Where it has been possible to give any carbohydrates without danger, the *ripe* banana has not only been well tolerated, but has rapidly brought about a better state of health."

The banana is more nutritive than the potato. In addition to the digestibility and palatability of the fruit the banana has another important feature, and that is its freedom from contamination because of its unbroken skin, the fruit really being in a germ-proof package.

CONSUMPTION.

The American consumption is 25 pounds per head per year. The Australian consumption is under 10 pounds per head per year, and in the Eastern States, where the market is well supplied, this could probably be doubled, while in this State our people are mostly starving for bananas, and if we could but produce them we have our whole population to serve.

VALUE OF THE INDUSTRY.

The world trade in the banana is enormous. The United Fruit Co. of America ranks as one of the first ten industrial companies in the United States of America. Its assets are over £49,000,000, and include a fleet of 80 steamers. It owes its prosperity entirely to the banana. In England Elders & Fyffes dominate the banana trade. This firm has ripening rooms capable of ripening 16,000 to 17,000 bunches at a time. The exports of the principal banana producing countries for 1929 were as follow:—

Jamaica	18,250,000 bunches (mostly "Gros Michel" variety).
Honduras	14,500,000 " " " "
Columbia	10,870,000 " " " "
Costa Rica	7,660,000 " " " "
Guatemala	6,000,000 " " " "
Mexico	4,150,000 " " " "
Canary Is.	7,500,000 (Cavendish variety).
Panama	4,000,000 (mixed varieties).
Cuba	3,000,000 " " "

The principal markets are the United States, Great Britain and Canada. The United States of America and Canada combined take 53,000,000 bunches per annum and Great Britain and the Continent import 25,000,000 bunches per annum.

In our own country its commercial production has been limited to two of the Eastern States—Queensland and New South Wales—where the industry is worth nearly two millions sterling. It is probable that no better bananas are produced in the world than in Queensland, where there are 5,000 growers engaged in the industry, and whose sales in Australasia amount to £1,250,000 per annum. Regular fruit trains, carrying from 3,000 to 6,000 cases weekly, travel from the Brisbane districts and North thereof conveying the fruit to Sydney, Melbourne, and Adelaide. With such a regular supply these cities have placed the banana high on the list of foods. Our capital is, however, very unfortunately situated with regard to necessary supplies from Queensland. Several attempts have been made to establish a trade connection for Queensland bananas, but with no great success. This is not surprising, as their transport from Queensland to Perth involves six handlings by train and at least two by boat. It has to be borne in mind that quick transport, and good ventilation, are very necessary to ensure that the fruit shall arrive at its destination in good condition, for it is neither possible to freeze or chill the mature or immature banana. On the other hand, however, if we can produce our own requirements in the North, as is believed possible, Perth is fortunately situated, for it is as far away from the Eastern States plantations as from Java, and there is a direct shipping service between the North-West ports and Fremantle.

IDEAL CONDITIONS.

Ideal conditions for the production of the banana would be a deep well-drained rich alluvial loam, or well-drained soil of volcanic origin rich in humus, in a well sheltered position, free from frost, near the coast, and with a well dis-

tributed rainfall of 50 inches upwards. The most successful banana producing countries in the world in point of acre yields include Honduras, Columbia, and Queensland, and the average rainfall in the banana districts in these lands is between 60 and 90 inches. On the West coast of Guatemala, which has large acreages, the annual average is over 150 inches. We are unfortunate in this State in not having ideal natural conditions in any part of our long Western coastline, but in spite of this we should not lose hope of establishing the industry on a sound basis. It is really a remarkable coincidence that one of the driest and most windy parts of our coast, viz., the Carnarvon district, should offer the best chance of commercial success, mainly on account of the deep friable fertile loam of the river frontages, the plentiful supply of water for irrigation at shallow depths in the river bed, and the proximity to the metropolis—48 hours direct steam.



An eight months planted area at Carnarvon.

Almost a parallel with us in the important banana producing countries is the Canary Islands, where bananas are grown under irrigation, largely on terraces on the hillsides, and most of these terraces have been built up. The production is high, averaging about 1,000 bunches per acre. The only variety grown there is the one the Department has advocated for Carnarvon, viz., the "Cavendish."

SOILS OF THE FAR NORTH.

The peaty soils found in or near all the pandanus spring areas of the North-West, and of which Beagle Bay and Udialla (Fitzroy) are typical examples, should grow the "Gros Michel" variety successfully in addition to the "Cavendish." It is unfortunate that several good areas are growing thickets of "Plantains" instead of heavy producing and more marketable sorts. In the station gardens also I would strongly recommend the discontinuance of plantains.

VARIETIES.

Among the varieties grown commercially in Australia the "Cavendish" easily takes precedence. It is the most dwarfish in growth and, therefore, less liable to damage by winds. Under very favourable conditions it will grow to 14 feet in height, usually about 9 to 12 feet, and each stalk or plant in the stool is capable of carrying 30 dozen fruit.

The "Sugar" banana was at one time largely grown in Southern Queensland, but is now seldom seen on account of its susceptibility to the Panama disease. The growth is tall and, therefore, very subject to wind injury.

The "Lady's Finger" is also a tall grower, probably less susceptible to frost than the other varieties, but the fruit has not a great demand.

The "Gros Michel" is a tall grower, and is very partial to heat and heavy rains. The fruit is large and carries well, though it has not the flavour of the "Cavendish."

The many varieties which have from time to time been introduced from Java and Singapore to parts of the North-West are entirely unsuited for the conditions which obtain there; not only do they suffer from the severe winds, but it must be borne in mind that their success in their native lands is due to the excessive heat and copious rainfall the whole year through, which is accompanied by high humidity and not dry heat and drying winds, such as are typical of some portions of our North.

NECESSITY FOR BREAKWINDS.

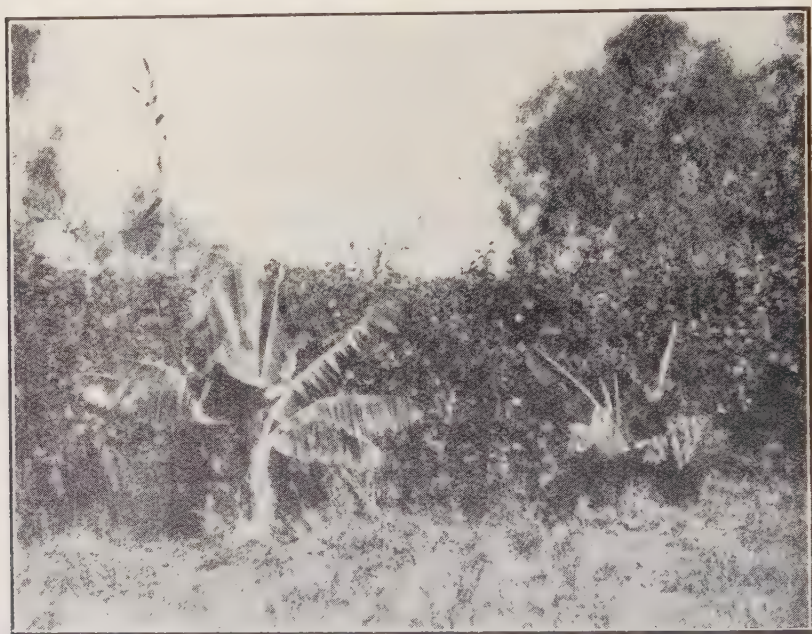
Viewing Carnarvon as the most likely district for the successful commercial production of the fruit under irrigation, the necessity for effective breakwinds must be stressed. On the northern bank of the Gascoyne River there is some protection afforded by the river gums, and in some of the hollows right close to the



The seven-year bean forms a dense mass of protective growth. This wall of green growing breakwind would be hard to excel, and can be trained to any height and planted at suitable intervals without any detriment to the other growing crops.

river these may be sufficient. For the most part, however, it must be accepted that breakwinds must be provided to counteract the deadly effect of the winds. During the brief space in which endeavours have been made to grow the banana in Carnarvon several kinds of breakwinds have been tried, including high galvanised iron fences, but it is doubtful whether a cheaper or more effective breakwind could be obtained than systems of high trellises of seven-year beans, which quickly provide a dense growth to any required height. They can be made to reach any desired

height, and there is no doubt of their efficacy and *no doubt of their necessity* at regular intervals throughout the intended plantation. Without adequate protection for the leaves, which are the food-manufacturing laboratories of the plant, good results cannot be expected. The accompanying photographs clearly indicate the utility of the seven-year bean for this purpose.



The effectiveness of the seven-year bean as a breakwind is clearly shown in the large unbroken leaves.

PREPARATION OF THE LAND.

Although the plant is not for its size and bulk a deep rooter—the lowest roots seldom going deeper than three feet—deep and thorough preparation is every essential. In the East a plough is almost unknown in a banana plantation, as the fruit is mostly grown on the steep hillsides, some of which are so steep that the bunches are sent down to the lower levels and sheds on wires and pulleys. This land is naturally well drained, is often very stony, and in its virgin state is covered with dense jungle costing to £5 per acre for felling alone.

Under our conditions, however, we must by thorough and deep preparation assist to promote fertility, secure perfect drainage and render the land fit for the severe demands of the healthy banana plant.

GRADING AND DRAINAGE.

For the purpose of economical and even distribution of water, careful grading is necessary. When grading, the natural contour must be studied and utilised as far as possible.

LIMING.

After grading, the application of 1 to 1½ tons per acre of lime will be advisable where the soils are acid, broadcasted and lightly harrowed in. Lime is an essential constituent for the banana; it will correct soil acidity, in all probability retard nematodes, and is best applied some weeks before planting. On no account use artificial fertilisers for some weeks after the application of lime.

Should planting be delayed after the ground is ready for the suckers, or if time permits, a crop of cowpeas (a fertilised crop to secure a heavy growth) could be grown to advantage and ploughed in when the pods are just setting. This will afford the best opportunity to apply humus and will assist in the retention of moisture. All forms of organic matter are essential to vigorous banana growth, and every effort should be made to preserve and add to the existing humus content of the soil.

SPACING.

The land being graded, with the object of effective watering, should be laid out in suitable rows from 12 to 16 feet apart, the plants to be 10 to 12 feet apart in the row. For thorough cultivation and watering, this spacing should be regulated to suit local conditions. Crowding of suckers and plants will reduce the size of the fruit, and will most likely shorten the profitable life of the plant. On the other hand, experience with plants under irrigation has not been long enough to set down hard and fast rules. A trial of different spacings on a given area is suggested to the intending grower.



A very desirable type of sucker to plant is illustrated in this photograph. Note the taper of the leaves and of the sucker itself terminating at the base with a large butt.

SUCKERS.

Propagation is made by means of suckers. There are many kinds and types of suckers, and, as in the case of all plants, good propagation stock is an essential factor. Suckers with a large butt or corm, which usually appear above ground with pointed (commonly known as "sword") leaves are desirable. The small solid round sucker taken from the base of the parent forms a good plant. Split butts

also make excellent plants; in fact "bits," as they are called in America, are very popular as plants. If the butt is not split, it is a good idea to gouge out some of the eyes, leaving only those well spaced to grow. There is a distinct advantage with butts in that there will be two or more (according to the number of eyes left) first bunches of good quality at the first bearing. It is also found that the following suckers are more easily controlled. Broad-leaved water suckers, with slender stems, should at all times be avoided. Very forward suckers will yield a quick



A broad-leaved sucker, not a desirable type to plant. Usually with little vigour and throwing a small first bunch.

bunch, but best results will be obtained from well-developed tapering suckers (see illustration). Size is not so important as vigour, which is indicated in the length of the sucker, its taper and its large butt. To prepare the sucker for planting, trim off all roots as closely as possible, cutting the stem off well below the foliage. Try and use suckers in which the sword-leaf is not fully developed; next to them use "butts."

PLANTING.

Bananas under irrigation are being specially dealt with, and bearing this in mind it would be well to give the ground a good watering a week prior to planting. If the preparation has been thorough it will not then be necessary to water until the plants have started to grow. Local conditions also affect the depth to plant. In alluvial soils the plants may be put in deeper to advantage, but if the subsoil is heavy, on no account plant in deep holes. For Carnarvon conditions it is suggested that the plants be set out in holes dug out to 18 inches, the base of the sucker when planted not to be covered by more than 5 inches of soil, so that the plant is started slightly lower than the average level of the land. The filling-in of the hole is completed by cultivation and the gradual development of the plant.

TIME TO PLANT.

It may be found that early planting will be best at Carnarvon. Early planting, *i.e.*, as soon as possible after there is any sign of spring, has the advantage of the plant having a good hold and being in a robust condition before the slack-

ening off of the growing period at the approach of winter. Should there be any summer rains they will then materially assist the plants, especially if the weather is humid.

PERIOD OF MATURITY.

Should large butts or forward suckers be planted it may occur that two or three first plants with several following suckers will grow before the first bunch is produced. Provided there are not too many, it is seldom necessary to remove any suckers prior to bunching; the general practice is to leave all suckers until the maiden plant has produced its first bunch. Should three large suckers on one stool come into bearing with their first bunch simultaneously, careful note of the ages and position of following suckers must be taken. *Three suckers and no more* should be allowed to follow the first cutting, which will provide larger bunches



Bunch within a few weeks of maturity. Note the position of the supporting prop, high up to take the weight.

of better fruit than if more are allowed to grow. De-suckering should be effected as soon as possible after fruiting, and care should be exercised that not any more roots than necessary are cut and damaged. Use a specially made bent bar, or with care, an ordinary mattock will serve. Water suckers may be removed at any time by cutting the top off the offending sucker low down to the ground and gouging out the centre. This will kill the sucker and not disturb the plant.

Cultivation between rows will consist of keeping the ground clean and the surface loose. When chipping close to the plants do not chip too deeply, but at a distance from them a deeper chipping or cultivation is suggested, which will assist the plants to root more deeply, and, in consequence, withstand dry spells better, and may also be a means of combating the nematode.

PROPPING BUNCHES.

It is necessary to prop the first bunch to prevent the plant from falling over. The weight of the bunch with the first fruit set almost pulls the plant out of the ground, and it is advisable as soon as the bunch is "set" to relieve the plant of the strain. Light props of split or round timber should be used, sufficiently long to form a solid support to the plant by placing high up immediately under the bunch, with the other end firmly in the ground. See the illustration showing how the prop should be placed. This is an important item, and by pressing the prop into the soft plant at the base of the bunch "handle" the plant is made quite rigid, and there is no danger of the bunch falling over, whereas if the prop is placed low down the plant will break off half-way up.

REMOVAL OF THE FLOWER BALL.

This is a practice not universally adopted. If it is done it should not be broken off too early or the plant will bleed for days and the fruit will suffer much more than if the ball is left on. The bleeding may be stopped by placing some soil on the cut made.

CUTTING THE BUNCH.

When the fruit has become rounded and filled it is approaching maturity, it will have lost its angles and will split from end to end if touched with the point of a sharp knife. Cut the bunch with as long a handle as possible for convenient handling, and do not bump or bruise the fruit. Every bump or bruise at this stage will appear in the ripened fruit. The absolutely correct stage to cut the bunch can only be determined by experience and observation. In the cooler months the fruit will hang much longer, and in any season the longer it can be left on to permit reaching the market in the proper condition the better. For some time at any rate the fruit grown at Carnarvon or anywhere in the North-West will find a local market and will, therefore, be marketed in the bunch. Later on, when there is a sufficiency to send to the city markets, the fruit will be packed in $1\frac{1}{2}$ bushel cases. Systems of packing, etc., will be dealt with when this time comes.

CUTTING OUT THE MATURED PLANT AFTER BEARING.

On some plantations in the Eastern States the plant which has completed its life's work and borne fruit is left for a few weeks before removal. The reason for this is that the sucker following is less likely to be damaged, and very quickly forges ahead if the parent stem is left for a few weeks. There is a danger in this practice, however, and that is there is a possibility of it being neglected, and in dying back forming a harbour for borers and other pests. On this account it is best, after removing the bunch, to cut out at once the finished plant as close to the ground as possible. It will then heal over and not form a harbour for borers. As above mentioned, be careful not to injure the "following" sucker during this operation. It can be taken that the first bunch will be cut any time from 14 to 20 months, according to the condition and age of the planted sucker, and the first following sucker of the parent will bear the next year.

LIFE OF THE PLANTS.

With care and proper treatment it is possible that the life of the plantation under our conditions should be at least six years. Under ordinary circumstances, i.e., relying on natural conditions and rains, this would be a long life, and above

the average of profitable life of most banana-producing lands. The plants would probably live until killed by disease, but if kept well watered, tended and fed, should live for six years, but heavy fertilising will be necessary after the second and third bunch to maintain the fruit of size and quality.

MANURING.

Although bananas may be grown in soils deficient in essential plant foods, they will not thrive unless the required constituents are made available. It is advisable that the humus content or the supply of organic matter should be high, and that it be kept up by green manuring, or other means.

A complete fertiliser for the banana recommended by Brunnich, and extensively used in the Eastern States, may be made from the following:—

Dried Blood—2 cwt.

Superphosphate—2 cwt.

Sulphate of Potash—2 cwt.

or

Nitrate of Soda or Dried Blood—2 cwt.

Bonedust—2 to 3 cwt.

Sulphate of Potash—2 cwt.

Both of these mixtures can be applied at the rate of five to eight pounds per mature stool; higher or lower quantities according to age, etc., of plants. Apply the above mixtures in two dressings, one towards the end of summer and the other at the end of winter. A very light dressing of salt at the rate of 1 cwt. of common salt per acre will benefit plants in soils of very low salt content, or to be safe and to assist to make good this deficiency use muriate of potash instead of sulphate of potash.

As can be expected with plants yielding such heavy crops, there is a constant drain on the fertility of the soil, and, generally speaking, it can be confidently stated that the banana cannot be overfed.

GREEN MANURING.

In the older countries of the world continuous cropping has gone on for centuries, and has been made possible by rotation of crops and a heavy supply of organic matter. Soils rich in iron, soils in hot climates, and soils cropped with such heavy feeders as tomatoes, bananas, etc., need heavy supplies of organic matter to retain their fertility. Soils of good humus content are able to retain moisture, and make good use of any chemical fertiliser applied. The growing of leguminous crops between the rows, especially if the land is fertilised for those crops, is a sure way to assist in this direction.

DISEASES AND PESTS.

Although the banana is prone to very many diseases of all kinds, including rusts, leaf spots, virus disease (bunchy top), Panama disease, etc., at present there are only two calling for lengthy comment at this stage of our development. They are banana weevil borer and nematodes.

BANANA WEEVIL BORER (*Cosmopolites sordida*).

This pest was found to be in the plantains in the Carnarvon district in 1923, when the first effort was being made to produce the banana commercially in this State. This pest is scattered throughout Australia; it has cost the banana in-

dustry of the world immense sums, and was introduced from the Pacific Islands and from the West Indies, very many years ago, prior to the passing of the Federal Quarantine Acts.

The beetle or fully matured insect is a true weevil about half an inch in length, with a very prominent trunk or proboscis; it has a hard shell, and like all weevils, feigns death when disturbed. The beetle usually lays its eggs at the base of the stem or on the corm, and when they hatch out the larvae eat their way into the corm, which they eventually tunnel through and destroy. The larvae are yellowish grubs about half an inch long with a brownish-coloured head. The general symptoms of the presence of the pest are a general unthrifty appearance of the plant, the whole plant showing signs of deterioration, bunches are small, and in the very advanced stages the plants have such a poor hold of the ground that they fall or are easily pushed over. The insects are usually of a very sluggish nature, do not travel far from their feed, and are usually spread by means of infested suckers and plants. Flight also plays some part in the dispersal of the pest, but, unless the plantations are contiguous, there is little danger from this means of infestation.

We know that this pest is in the Carnarvon district, and, therefore, even if there are no symptoms of it in any plantation, a careful lookout is urged, and, if the beetles are found, no time or effort should be spared in an endeavour to exterminate them.

CONTROL MEASURES.

As has been repeatedly pointed out by our Entomologist, there is little hope of employing sprays or fumigants against this pest, as in all stages of its life cycle, except the adult stage, it is securely protected behind a barrier of plant tissue; attention must, therefore, be confined to the beetle itself.

In practice it has been found that the beetles are attracted to baits, and further, that the beetles so attracted may be killed by poison. A simple method of trapping the mature insect has been practised for years. It has been found that the beetle is very partial to the flesh or the fully matured corm, and by taking the corm from the base of a stem having matured its bunch, cutting it in halves and placing the cut surfaces to the ground near the stool, the insects will be attracted and will be found adhering to the bait or immediately under it, and can be gathered and destroyed. By dusting the baits with Paris Green the two operations may be combined. It is desired to impress and insist that it is a serious obligation on the part of all interested in the industry to keep a careful watch for this pest, and the policy to be adopted is to keep new areas clean by careful examination and trimming of suckers prior to planting, and, should infestation occur, destroy all corms showing the presence of borer tunnels and adopt the simple measures of control herein mentioned.

NEMATODE OR EEL-WORM.

This is a serious pest in some areas in the State and is very destructive. The list of economic plants attacked is very large, and the presence of the pest in the root system is usually associated with disastrous results to the plants attacked. Although a large number of species of gall worms are included under the name of nematodes, the most serious is the one which affects bananas, tomatoes, potatoes, beet, pineapples, watermelons, etc. The disease is readily seen on examination of the roots, when irregular lumps will be seen which interfere with the functioning of the plant. The banana is very susceptible. When the young nematode enters the root it begins to enlarge, and feeds on the root tissues, irritating them;

they then swell and form the gall, and so serious does the trouble become that water and the plant foods cannot pass through the roots. It can be definitely stated that the cure of infested plants is quite outside the bounds of possibility, hence control should aim at destroying or reducing the number in infested soils, and keeping uninfested land clean. The spread of the pest is facilitated by ordinary farm operations; implements used in infested areas will transfer the pest, and they will be similarly transported in the soil adhering to the boots of men or to the hoofs of horses. They will also be carried in the water when irrigating.

Prior to planting bananas in new land, after all the roots have been closely trimmed, the plants should be immersed in a solution of corrosive sublimate at a strength of 1oz. to six gallons of water, and, as dealt with earlier, the plants should be set in a depression in the soil. Even where infestation is present, plants may be kept on a profitable basis by constant and thorough cultivation and heavy manuring. The most economic way to control the pest is by a system of rotation in which crops which are immune to the attack of nematodes feature prominently. In this way they may be starved out of the soil. Nematodes have been known to live in soil for more than a year, even when no food plants are present, so that a systematic rotation is very necessary. Among the plants that are immune to attack, or are but slightly affected, are maize, sorghums, broom millet, barley, peanuts, some cowpeas, most grasses, and velvet beans. These common crops, which are known to be resistant to the attack of the pest, may be used in a well planned rotation with profit, and should permit of the subsequent growing of the banana in a soil in which the pests have been reduced to a minimum.

OTHER DISEASES.

There are many diseases of the fruit and leaves as well as many pests, some of which are of trifling importance to the grower. There are, however, some chances that the industry will be handicapped by the incidence of pests, such as fruit-eating caterpillars and fruit spotting bugs, which will, when they appear, be dealt with by the Entomologist of the Department of Agriculture.

"LUMPY OR MATTED WOOL," OR MYCOTIC DERMATITIS IN SHEEP.

J. F. FILMER, B.V.Sc.

During recent years several cases of a peculiar condition affecting the skin and wool of sheep have been brought to the notice of the Veterinary Branch.

In these cases the wool has been found to be matted together by a hard horny-like material. As a rule this does not come to the tip of the wool and the disease may therefore not be detected until the animal is handled. It will then be found that the horny-like material is really an exudate coming from a disease of the skin. The horny masses are generally somewhat cone shaped, with the broad base towards the skin. Thus when an affected mass of wool is removed all the wool will be matted together at the base, whereas at the tip there will be a proportion of normal wool outside the horny matted core.

In active cases these horny masses are rather firmly attached to the skin and can only be detached with difficulty. When this is done the exposed skin presents an inflamed appearance. The base of the horny cone will be found to be concave. It is attached to the skin around the outer edge only.

In cases which have ceased to be active the affected masses of wool may have been pushed away from the skin and there may be normal wool underneath them. Generally the back only is affected, but occasionally the head and legs may become involved.

Until recently the cause of this condition was not known. However, during 1929, reports were published by Dr. H. R. Seddon, New South Wales, and Dr. L. B. Bull, in South Australia, concerning investigations of this disease. Both these Veterinary Pathologists discovered in the scabs of affected sheep a fungus or mould. Dr. Bull has grown this in artificial media and has produced the disease with pure cultures of the organism for which he has proposed the name *Actinomyces dermatonomus*. Working with material from a Western Australian case an organism was recently discovered which appears to be identical with that described by Dr. Seddon and Dr. Bull.

In New South Wales and South Australia the disease has been found to be largely confined to young sheep, under two years old. As a rule only a small percentage of the flock is affected, though cases of 10 and 20 per cent. affection of small flocks of young sheep have been reported in South Australia.

The disease may be transmitted by rubbing into the skin an emulsion of scab from an affected sheep. So far it has not been found possible to affect a healthy sheep by confining it with affected sheep. There is some evidence to show that the disease is contracted during wet weather and that moisture of the fleece makes a sheep more susceptible.

In Western Australia, in one flock where several cases of this disease have occurred, another condition was detected. In these sheep small granules of yolk-like material were seen in the wool and the sheep were noticed to have been rubbing. Examination in the laboratory did not enable any definite conclusion to be reached, but it is suggested that this may be the early stage of the same disease.

Very little work has yet been done in regard to prevention and cure. However, Dr. Bull has shown that the organism is readily destroyed by Copper Sulphate solution, and has suggested dipping in a solution containing 1 lb. Copper Sulphate in 50 gallons of water.

All affected sheep should be shorn as soon as detected and should then be dipped in the above solution. If the disease threatens to become widespread, young sheep should be dipped in the Autumn immediately after first rains. If the disease appears they should be re-dipped a month later.

Dr. Seddon has shown that the detached scab may remain infective for over a year. It is therefore important to prevent affected sheep shedding scabs in the paddocks. Affected sheep should be segregated and shorn separately and all affected wool should be burnt.

TRIALS WITH THE CASSINA TEA PLANT.

(Ilex vomitoria.)

By G. L. THROSSELL, Agricultural Adviser.

In order to ascertain whether the Cassina Tea Plant (*Ilex vomitoria*), a tea substitute, could be grown successfully in Western Australia, samples of the seed received from the "Sunday Times" Newspaper Company, Limited in 1927, were planted at the Merredin and Chapman Experiment Farms for trial.

The Cassina Tea plant is a native of the South Atlantic and Gulf coasts of the United States, where it was used by the American Indians for making a stimulating beverage. Another species, *Ilex Paraguayensis*, commonly called Yerba Mate, is used extensively in South America, and in the Argentine alone more than 140,000,000 lbs. per annum are consumed, the source of this being chiefly Brazil and Paraguay.

The seed supplied to this department was sent to the Chapman Experiment Farm for "stratification," a process of placing the seed in layers of moist sand for a period of six months prior to planting. Portion of this stratified seed was then sent to the Merredin Experiment Farm, and plantings were made that year (1928) at both farms in well worked fallow. The soil at the Chapman Farm was a sandy loam, and at the Merredin Farm a sandy and clay loam, and both were ploughed early in the previous winter and cultivated as required to maintain a mulch and destroy weed growth until planting time. At both farms none of the seed germinated, despite the care that had been taken.

The rainfall recorded during 1928 was 8.73 inches at the Merredin Experiment Farm and 17.89 inches at Chapman, while the average rainfall at these farms is respectively 11.85 inches and 16.45 inches.

The result of this trial confirms the view held by the late Government Botanist and Plant Pathologist (Mr. W. M. Carne) who, in December, 1927, reported on the Cassina Tea Plant as follows:—

"There appears to be little hope of this plant succeeding in this State, either horticulturally or commercially.

1. The plant is native to coastal, sandy soils in the States of Virginia, Texas, North and South Carolina, and to other South-Eastern portions of the United States of America. These areas have rainfalls varying from 45 to 60 inches per annum, of which approximately two-thirds occurs in the summer, with not less than two inches in any month. We have no corresponding climatic area on the coasts of this State.

2. From our experience with Yerba Mate, which was distributed in 1926, there is little doubt that Australians will continue to use tea in preference to any substitutes. *Ilex* preparations resemble tea only in the modes of preparation. It is unlikely that they would ever have a big sale in Australia though they may have a limited sale amongst food faddists and people unable to take tea."

AGRICULTURAL SEEDS AND THEIR WEED SEED IMPURITIES.

H. G.^W ELLIOTT, Dip. Agric.
Assistant Plant Pathologist.

(Continued from p. 494.)

Scientific Name.					Common Name.
vi. Dactylis glomerata					Cocksfoot
Containing :—					
A. <i>Grasses</i> —					
	Lolium perenne	...	...	...	Perennial Rye-grass
B. <i>Other Weeds</i> —					
	Rumex acetosella	...	...	...	Sorrel (3)
vii. Bromus unioloides					Prairie Grass
Containing :—					
A. <i>Legumes</i> —					
	Trifolium dubium	...	...	...	Suckling Clover
B. <i>Grasses</i> —					
	Avena fatua	...	...	...	Black Oat
	A. sativa	...	...	...	Oat
	Paspalum dilitatum	...	...	...	Paspalum
C. <i>Other Weeds</i> —					
	Malva parviflora	...	...	...	Mallow
viii. Chloris gayana					Rhodes Grass
Containing :—					
A. <i>Grasses</i> —					
	Agrostis vulgaris	...	...	...	Red Top (2)
	Setaria viridis	...	...	...	Pigeon Grass (3)
B. <i>Other Weeds</i> —					
	Amaranthus retroflexus	...	...	...	Pigweed
	Plantago lanceolata	...	...	...	Ribgrass (2)
ix. Lolium perenne					Perennial Rye-grass
Containing :—					
A. <i>Legumes</i> —					
	Medicago denticulata	...	...	...	Burr Medic
	M. lupulina	...	...	...	English Trefoil (2)
	Trifolium agrarium	...	...	...	Hop Clover
	T. dubium	...	...	...	Suckling Clover
	T. repens	...	...	...	White Clover (4)
B. <i>Grasses</i> —					
	Bromus hordeaceus	...	...	...	Silver Grass (3)
	B. mollis	...	...	...	Soft Brome (2)
	* B. secalinus	...	...	...	Chess or Cheat
	Festuca bromoides	...	...	...	Silvery Grass (3)
	F. Myuros	...	...	...	Silvery Grass (2)
	Holcus lanatus	...	...	...	Yorkshire Fog (2)
	Lolium multiflorum	...	...	...	Italian Rye-grass (5)
	Phleum pratense	...	...	...	Timothy
C. <i>Other Weeds</i> —					
	Brassica nigra	...	...	...	Black Mustard (3)
	Hypochoeris radicata	...	...	...	Flat Weed
	Myosotis sp.	...	...	...	Forget-me-not
	*Polygonum persicaria	...	...	...	Smartweed
	Ranunculus sp.	...	...	...	Buttercup (2)
	Rumex acetosella	...	...	...	Sorrel
	Rumex spp.	...	...	...	Docks (4)

Scientific Name.					Common Name.
x. <i>Lolium multiflorum</i>					Italian Rye-grass
Containing :—					
A. <i>Legumes</i> —					
	<i>Medicago denticulata</i>	...	...	...	Burr Medic
	<i>Trifolium dubium</i>	...	...	...	Suckling Clover (3)
	<i>T. pratense</i>	...	...	...	Red Clover
B. <i>Grasses</i> —					
	<i>Alopecurus</i> sp.	...	...	...	Foxtail
	* <i>Bromus secalinus</i>	...	...	...	Cheat
	<i>Festuca bromoides</i>	...	...	...	Rat-tail Grass (3)
	<i>Holcus lanatus</i>	...	...	...	Yorkshire Fog
	<i>Lolium perenne</i>	...	...	...	Perennial Rye-grass (2)
C. <i>Other Weeds</i> —					
	<i>Brassica nigra</i>	...	...	...	Black Mustard
	* <i>Centaurea cyaneus</i>	...	...	...	Star Thistle
	<i>Daucus carota</i>	...	...	...	Carrot
	<i>Hypochoeris radicata</i>	...	...	...	Flatweed
	<i>Plantago lanceolata</i>	...	...	...	Ribgrass
	* <i>Polygonum persicaria</i>	...	...	...	Smartweed
	<i>Ranunculus</i> sp.	...	...	...	Buttercup (2)
	<i>Rumex acetosella</i>	...	...	...	Sorrel
	<i>Rumex</i> spp.	...	...	...	Docks
	<i>Sonchus oleracea</i>	...	...	...	Milk Thistle (2)
xi. <i>Lolium subulatum</i>					Wimmera Rye-grass
Containing :—					
A. <i>Legumes</i> —					
	<i>Melilotus indica</i>	...	...	...	King Island Melilot
	<i>Medicago denticulata</i>	...	...	...	Burr Medic
	<i>Trifolium agrarium</i>	...	...	...	Hop Clover
G. <i>Grasses</i> —					
	<i>Avena sativa</i>	...	...	...	Oat
	<i>Bromus hordeaceus</i>	...	...	...	Silver Grass
	B. <i>madritensis</i>	...	...	...	Spear Grass
	B. <i>mollis</i>	...	...	...	Soft Brome (2)
	<i>Festuca bromoides</i>	...	...	...	Silvery Grass (3)
	F. <i>Myuros</i>	...	...	...	Silvery Grass (2)
	<i>Hordeum murinum</i>	...	...	...	Barley Grass (2)
	<i>Lolium multiflorum</i>	...	...	...	Italian Rye-grass (3)
	L. <i>perenne</i>	...	...	...	Perennial Rye-grass (2)
	<i>Phalaris minor</i>	...	...	...	Canary Grass
C. <i>Other Weeds</i> —					
	* <i>Polygonum aviculare</i>	...	...	...	Wireweed (2)
	<i>Rumex acetosella</i>	...	...	...	Sorrel
	<i>Silene gallica</i>	...	...	...	French Catchfly
xii. <i>Triticum sativum</i>					Wheat
Containing :—					
A. <i>Legumes</i> —					
	<i>Vicia</i> spp.	...	...	...	Vetches (2)
B. <i>Grasses</i> —					
	<i>Avena sativa</i>	...	...	...	Oat (8)
	<i>Hordeum vulgare</i>	...	...	...	Barley (4)
	<i>Lolium perenne</i>	...	...	...	Perennial Rye-grass (3)
	L. <i>temulentum</i>	...	...	...	Drake (4)

Scientific Name.				Common Name.
C. <i>Other Weeds</i> —				
Amaranthus retroflexus	...	...	...	Pigweed
*Brassica sinapistrum	...	...	...	Charlock (2)
B. nigra	...	...	...	Black Mustard (2)
*Galium aparine	...	...	...	Cleavers (5)
*Lychnis Githago	...	...	...	Corncockle
*Polygonum convolvulus	...	...	...	Black Bindweed (3)
*P. persicaria	...	...	...	Persicaria
Ranunculus arvensis	...	...	...	Buttercup
*Raphanus raphanistrum	...	...	...	Wild Radish (3)
Rumex spp.	...	...	...	Docks (2)
Scandix Pecten-Veneris	...	...	...	Shepherd's Needle
xiii. <i>Hordeum vulgare</i> Barley				
Containing :—				
A. <i>Grasses</i> —				
Avena sativa	...	...	...	Oat (4)
A. sterilis	...	...	...	False Wild Oat (2)
Bromus villosus	...	...	...	Brome Grass
B. <i>Other Weeds</i> —				
*Raphanus raphanistrum	...	...	...	Wild Radish (4)
Silene gallica	...	...	...	French Catchfly (2)
2. [■] MORACEAE.				
i. <i>Cannabis sativa</i> Hemp				
Containing :—				
A. <i>Legumes</i> —				
Pisum arvense	...	...	...	Field Pea
B. <i>Grasses</i> —				
Andropogon sorghum	...	...	...	Sorghum
Panicum miliaceum	...	...	...	French Millet
Setaria italica	...	...	...	Italian Millet
C. <i>Other Weeds</i> —				
Coriandrum sativum	...	...	...	Coriander
3. POLYGONACEAE.				
i. <i>Fagopyrum esculentum</i> Buckwheat				
Containing :—				
A. <i>Grasses</i> —				
Lolium perenne	...	...	...	Perennial Rye-grass
Linum usitatissimum	...	...	...	Linseed (Flax) (3)
Panicum miliaceum	...	...	...	French Millet
4. CHENOPODIACEAE.				
i. <i>Beta vulgaris</i> Beet and Mangel				
Containing :—				
A. <i>Grasses</i> —				
Avena sativa	...	...	...	Oat
Hordeum vulgare	...	...	...	Barley
Lolium temulentum	...	...	...	Drake
Phalaris canariensis	...	...	...	Canary Grass
Triticum sativum	...	...	...	Wheat
B. <i>Other Weeds</i> —				
Brassica nigra	...	...	...	Black Mustard
Euphorbia peplus	...	...	...	Milkweed
*Galium aparine	...	...	...	Cleavers (5)
*Polygonum convolvulus	...	...	...	Black Bindweed
Rumex spp.	...	...	...	Docks

Scientific Name.					Common Name.
5. CRUCIFERAE.					
i. <i>Brassica</i> spp.					Cabbage, Turnip, etc.
Containing :—					
A. <i>Legumes</i> —					
	<i>Melilotus indica</i>				King Island Melilot (3)
	<i>Trifolium incarnatum</i>				Crimson Clover (2)
	<i>T. glomeratum</i>				Cluster Clover
	<i>T. pratense</i>				Red Clover
B. <i>Grasses</i> —					
	<i>Oryza sativa</i>				Rice
	<i>Triticum sativum</i>				Wheat
C. <i>Other Weeds</i> —					
	<i>Brassica nigra</i>				Black Mustard (3)
	<i>Cichorium intybus</i>				Chicory (2)
	<i>Chenopodium album</i>				Mexican Spinach (3)
	* <i>Echium</i> sp.				Viper's Bugloss
	<i>Fumaria officinalis</i>				Fumitory (2)
	* <i>Galium aparine</i>				Cleavers
	<i>Plantago lanceolata</i>				Ribgrass
	* <i>Raphanus raphanistrum</i>				Wild Radish
	<i>Rumex</i> spp.				Dock (3)
	<i>Silene noctiflora</i>				Catchfly (2)
ii. <i>Raphanus sativa</i>					Radish
Containing :—					
A. <i>Grasses</i> —					
	<i>Triticum sativum</i>				Wheat
B. <i>Other Weeds</i> —					
	<i>Chenopodium album</i>				Mexican Spinach (3)
	* <i>Galium aparine</i>				Cleavers
	* <i>Polygonum aviculare</i>				Wireweed
6. ROSACEAE.					
i. <i>Poterium sanguisorba</i>					Sheep's Burnet
Containing :—					
A. <i>Legumes</i> —					
	<i>Hedysarum coronarium</i>				Hedysarum (2)
	<i>Lathyrus</i> spp.				Vetchlings (2)
	<i>Onobrychis sativa</i>				Sainfoin (4)
B. <i>Grasses</i> —					
	<i>Avena sativa</i>				Oat (2)
	<i>Hordeum vulgare</i>				Barley (2)
	<i>Lolium perenne</i>				Perennial Rye-grass (2)
	<i>Phalaris canariensis</i>				Canary Grass
	<i>Triticum sativum</i>				Wheat (3)
C. <i>Other Weeds</i> —					
	* <i>Echium</i> spp.				Viper's Bugloss (2)
	<i>Euphorbia</i> spp.				Milkweed (2)
	* <i>Galium aparine</i>				Cleavers (2)
	<i>Linum usitatissimum</i>				Linseed (Flax) (3)
	* <i>Polygonum convolvulus</i>				Bindweed (2)
	* <i>Raphanus raphanistrum</i>				Wild Radish (4)
	<i>Tragopogon</i> sp.				Salsify (2)

* Noxious weeds under the Agricultural Seed Act, 1923,

(To be continued.)

NITROGENOUS FERTILISERS.

L. J. H. TEAKLE,

Plant Nutrition Officer.

Sir William Crookes, F.R.S., in his Presidential address to the British Association for the Advancement of Science in 1898, discussed the world's wheat supply and the possibility of a shortage of this superior food of the Caucasian race. From a study of statistics and an estimation of the virgin land available for cultivation in the new countries, Australasia, America, etc., he predicted that there would be a shortage of wheat from 1931 if the wheat eating population of the world maintained the normal rate of increase and the bushel yield per acre remained stationary. Sir William Crookes suggested that the supply of available nitrogen was the limiting factor in production, and submitted the problem of commercial fixation of atmospheric nitrogen to chemists. The year 1931 dawns upon a market glutted with wheat, and we find that the chemist has been able to provide the agriculturalist with an abundance of cheap synthetic nitrogenous fertilisers to supplement the enhanced supplies obtained as bye products from the coal industries, and those supplies arising from biological action in the soils themselves. The mechanisation of agricultural practice has greatly increased the efficiency of farm labour, and with improvements resulting from biological research has enabled the confines of the wheat belt to be widened to an undreamed of extent. A food shortage in the near future is unlikely, as the still untapped resources of North and South America and Australia are available when the call for more wheat is raised. The production from these countries merely supplements that of the closely settled nations where intensive methods, calling for the continued use of the new nitrogenous fertilisers, are responsible for a lessened demand for the primary products from overseas. It now becomes a battle for the diminished markets, and the line of attack appears to be by way of lowered production costs. It is imperative that the cost of production per unit be reduced if products are to compete successfully in the world's markets.

Among the avenues leading to a reduction of production costs is that of an improved fertiliser practice, and farmers are now being urged by manufacturers to make use of nitrogenous fertilisers to enhance the return for their effort.

In view of the increasing attention being given to the use of inorganic nitrogen compounds as fertilisers, it will be of interest to follow the history of some of the more important types.

Sodium nitrate, or Chili saltpetre, was first exploited in 1830, when a shipment of 800 tons was obtained from Iquique, South America. By 1840 the annual output had arisen to 10,000 tons, and in 1907 amounted to 1,660,000 tons of the crude salt containing 15 to 16 per cent. nitrogen (H. J. Wheeler, "Manures and Fertilisers"). In 1928 the consumption of Chili saltpetre amounted to 2,550,000 tons per annum.

Ammonium sulphate was first manufactured successfully along commercial lines in 1858, when it was obtained as a bye-product of the coke industry at St. Denis. By 1903 over 450,000 tons of ammonium sulphate per annum were produced in the coal industries, and this figure increased to 1,920,000 tons in 1928.

Synthetic nitrogenous fertilisers were first available on the market in the first decade of this century.

In 1905 Birkeland and Eyde in Norway succeeded in commercialising the production of nitric acid from the nitrogen and oxygen of the air and marketed the produce as nitrate of lime or Norwegian saltpetre.

Frank and Caro in Berlin prepared calcium cyanamide, "nitrolime" or lime nitrogen, in 1895, but very little was produced for several years. By 1912, however, factories had been established in various parts of the world, and sales in that year amounted to about 100,000 tons per annum. The commercial product contains 17 to 20 per cent. nitrogen.

The Haber process for the combination of gaseous nitrogen and hydrogen to form ammonium salts was commercialised during the war in Germany. After the war the German and English interests combined, and in those countries enormous quantities of ammonium sulphate are now being produced by this method. In 1924 1,250,000 tons of ammonium sulphate were produced by the modified Haber process, and in 1928 the production amounted to over three million tons per annum.

Table 1 shows the world's output of nitrogenous manures in long tons of pure fixed nitrogen.

TABLE 1.

The World's output of Nitrogenous Fertilisers, 1903-1928, expressed as long tons of Pure Nitrogen.

Fertiliser Produced.	1903.		1912.		1924-25.		1927-28.	
	tons.	%	tons.	%	tons.	%	tons.	%
Sulphate of ammonia, by-product ...	108,000	32.8	247,000	36.5	290,000	26.0	384,300	23.6
Sulphate of ammonia, synthetic ...	...	...	...	...	255,000	23.1	607,000	37.3
Calcium nitrate, synthetic ...	...	...	10,000	1.5	25,000	2.3	29,400	1.8
Cyanamide (lime nitrogen), synthetic ...	...	...	19,000	2.8	115,000	10.4	223,000	13.7
Chili saltpetre (mined)	221,000	67.2	401,000	59.2	363,000	32.8	383,000	23.6
Others ...	...	...	...	...	60,000	5.4	...	...
Total ...	329,000	...	677,000	...	1,108,000	...	1,628,700	...
Value at £75 per ton	£24,675,000		£50,775,000		£83,100,000		£122,152,000	

From this table it is seen that ammonium sulphate constituted 60.9 per cent., the nitrate fertiliser 25.4 per cent., and the lime nitrogen 13.7 per cent. of the total output in the year ending May, 1928. Of this total output of 1,628,700 tons of pure fixed nitrogen, 1,425,000 tons were used in agriculture.

While the world's output of nitrogenous manures has reached such enormous dimensions, Western Australia, as yet, depends very largely on her natural resources; we rely on the biological activities in our soils to maintain the supplies of available nitrogen. There is an increasing interest being evidenced in these valuable amendments, and the number of lines now on the market shows that the advantages of the use of nitrogen for crop growth is being emphasised by merchants and recognised by farmers. While the quantities used are still small, there is every likelihood of a material increase in consumption in the future.

The imports into Western Australia for the year ending 30th June, 1930, are shown in Table 2.

Table 2.

*Nitrogenous fertiliser imported into Western Australia,
1st July, 1929, to 30th June, 1930.*

Fertiliser.	Imports.	
	Tons.	Per cent.
Ammonium sulphate	2,369	53.4
Sodium nitrate	1,735	39.1
Nitrophoska	272	6.1
Calnitro	30	0.7
Diammonphos	31	0.7
Ammonium chloride	1	..
Total	4,438	100

NITROGENOUS FERTILISERS IN AGRICULTURE.

It is recognised that nitrogen is the plant food most urgently required in many parts of the humid region of the world. This is the general experience in England, where response to other fertilisers is often conditioned by an adequate supply of nitrogen as fertiliser. It is reported in "Farm Notes," Vol. 4, p. 4, 1930, that Sir John Russell has calculated that for all soils and climates in the British Isles, 1 cwt. of ammonium sulphate will give an average increase of 2½ cwt. (4 bushels 40 lbs.) of wheat. Similar calculations have been made to show that the yield of barley would be increased from 4 to 7 bushels, winter oats from 7-12 bushels, potatoes 15-20 cwt., and sugar beet 20-25 cwt. per acre.

As soils become exhausted by continual cropping it becomes important to enhance the supply of available nitrogen either by crop rotation and management or the addition of artificials.

Even in Western Australia it appears that the nitrogen supply in certain of our light lands must be improved before full advantage can be taken of phosphatic manures, and it seems likely that there will be an increased demand for these fertilisers as new systems of agriculture and stock management are adopted, as has been the experience in Germany and England.

Returns from nitrogenous dressings in Western Australia show that there is a decided nitrogen lack under certain conditions. Yields of potatoes were doubled at Gosnells by the addition of 500 lbs. of sulphate of ammonia per acre (Palmer, J. C., 1929). At Benger slight increases in the yield of potatoes were obtained by the use of ammonium sulphate (Palmer, J. C., 1930). Wheat responded to ammonium sulphate on the Wongan Hills Light Lands Experiment, the average yields of grain of the five plots devoted to each experiment being as follows:

	Fallow.	Non Fallow.
No nitrogen	377 lbs./ac.	578 lbs./ac.
1 cwt. ammonium sulphate per acre ..	668 lbs./ac.	748 lbs./ac.
2 cwt. ammonium sulphate per acre ..	731 lbs./ac.	877 lbs./ac.

All plots received the usual dressing of 120 lbs. of 22 per cent. superphosphate per acre (Thomas & Venton, 1930).

Very marked stimulation of the growth of Wimmera rye grass following the application of ammonium sulphate at the rate of 1cwt. per acre has been observed on the coastal plain at Esperance and on Mr. W. G. Burgess's farm at "Tipperary," York.

Experiments on Mr. Pearson's farm at Benger, near Bunbury, this year show that the carrying capacity of pasture is improved by nitrogenous dressings in addition to superphosphate. Four acre paddocks were grazed to cows with the following results:—

No nitrogen—467 cow grazing days.

150lbs. nitro chalk (per acre) applied in autumn—522 cow grazing days.

Ammonium sulphate, (per acre) 1cwt. in autumn and 1cwt. in spring—590 cow grazing days. ("West Australian," 13th Nov., 1930.)

These experiments indicate that there is a field for the judicious use of nitrogenous fertilisers in Western Australia or, failing that, a necessity for the rotation of crops to maintain or increase supplies of available nitrogen in the soil by biological means.

NITROGENOUS FERTILISERS AND THE SOIL.

It has been found by experiment and experience that the use of nitrogenous fertilisers has a great effect, not only on crop growth, but on the soil. Some forms, for instance, sodium nitrate, are physiologically alkaline, that is, they lead to the improvement of acid soils as a result of crop growth and the utilisation



of the nitrate. Others, for instance ammonium sulphate, are acid forming materials, or physiologically acid fertilisers, and induce serious soil acidity in the absence of adequate supplies of lime. For this reason it is necessary to be very careful in the selection and use of nitrogenous fertilisers. Sodium nitrate is

found to be deleterious for certain crops on the basic soils of arid or semi-arid regions. The writer has seen orange trees practically ruined by this fertiliser at riverside, California. Heavy clay soils, even under humid conditions, are found to be slightly puddled by sodium nitrate due to the effect of the element sodium which reacts with the soil.

Calcium nitrate or Norwegian saltpetre is a physiologically alkaline substance but is expected to improve the soil structure on account of the lime present.

Ammonium salts must always be used with caution if the soils are light textured and low in lime. A programme of liming is indispensable where ammonium fertilisers are used on these soils except for certain acid tolerant crops. Deherain recommends ammonium salts for use on stiff or heavy land only.



The choice of nitrogenous fertilisers may determine the composition of a pasture. At Rhode Island, U.S.A., the ammonium sulphate plots were dominated by red fescue and sheep's fescue, while on the sodium nitrate plots adjacent these plants were practically eliminated by Kentucky blue grass, white clover, and other grasses and weeds. At this station it was found that *in the absence of lime* continued application of ammonium sulphate induced conditions prohibitive to the successful growth of lettuce, spinach, beets, cress, cabbage, cauliflower, asparagus, cantaloupes (rock melons), clover, lucerne, beans, peas, vetch, Kentucky blue grass, timothy, etc. Blackberry, sorrell, water melon, and cranberry were found to be tolerant to the acid conditions induced.

A similar experience is reported from Woburn, England, where the soils are light and deficient in lime.

An extract from the Report, 1929, of the Rothamsted Experiment Station is given in Table 3.

TABLE 3.

Effect of applications of Nitrogenous Manures on Growth of Wheat and Barley with and without Lime at Woburn, England (51st year of the experiment). All plots received Superphosphate and Sulphate of Potash in addition to the Nitrogenous Manure.

Manuring.	Barley.				Wheat.			
	Plot.	Unlimed	Plot.	Limed.	Plot.	Unlimed.	Plot.	Limed.
		bus.		bus.		bus.		bus.
Sulphate of Ammonia ...	5a	5.8	5aa	15.0	5a	10.9	5b	13.3
Do. ...	8a	1.1	8aa	29.2	8a	2.7	8aa	7.9
Do. ...	8b	3.7	8bb	30.3	8b	2.9	8bb	9.4
Nitrate of Soda ...	6	30.6	...	...	6	12.8	...	...
Do. ...	9a	33.9	...	...	9a	17.2	...	...
Do. ...	9b	36.0	...	...	9b	17.0	...	...
No manure ...	1	11.1	...	...	1	20.4	...	...

At Rothamsted, where the soils are heavy and abundantly supplied with lime, no deleterious effects on crop yield from the continued use of ammonium sulphate have been noted. The chemical effect on the soils can be detected.

A long time experiment on the availability of nitrogenous fertilisers has been conducted at the New Jersey Agricultural Experiment Station and reported in a series of papers in "Soil Science" (Lipman, J. G., and Blair, A. W. (1920); Lipman, J. G., Blair, A. W., and Prince, A. L. (1925) (1928)). The soil was a loam, inclined to a gravelly phase, and was slightly acid in reaction, showing a lime requirement of 1,000 to 1,600 lbs. of CaO (hot lime) per acre. A rotation involving crops of maize, oats, wheat and timothy was arranged and continued from 1908 to 1927. The yields of wheat are selected as indicative of the trend of soil conditions and are reported in Table 4.

TABLE 4.

Yield of wheat at New Jersey Experiment Station under various manured treatments. All plots received superphosphate and potash, except the no manure plots.

Plot.	Fertiliser Treatment.	Unlimed.			Limed.		
		1915.	1920.†	1925.	1915.	1920. †	1925.
		lbs./acre.	lbs./acre.	lbs./acre.	lbs./acre.	lbs./acre.	lbs./acre.
1	No manure ...	940	796	740	680	320	754
8	Sod. nitrate, 160lbs. per acre	1,120	1,036	1,303	1,100	1,068	1,444
9	Sod. nitrate, 320lbs. per acre	1,740	1,308	1,438	1,280	1,244	1,499
10*	Calcium nitrate ...	1,540	1,256	1,401	1,660	1,284	1,742
11*	Ammonium sulphate ...	1,280	56	101	1,600	1,360	1,735
12*	Cyanamide ...	1,460	1,452	1,879	1,500	1,432	1,849
13*	Dried blood ...	1,420	1,112	...	1,400	1,240	...

* Plots 10, 11, 12 and 13 received nitrogen equivalent to 320-lbs. sodium nitrate per acre.

† Barley was grown instead of wheat in 1920.

On the unlimed ammonium sulphate plots the timothy was almost entirely replaced by sorrell (*Rumex acetosella*) and crab grass (*Digitaria* sp.).

The effect of the fertiliser treatments on these plots is discussed by Blair and Prince (1922). Plate 1, from their paper, shows the effect of continued dressings of ammonium sulphate with and without lime on the growth of barley which was used in the rotation instead of wheat in 1920.

From Table 4 it is evident that, while ammonium sulphate is approximately equal to the other nitrogen fertilisers in the early stages, the soil eventually is rendered sterile for ordinary crops unless it is abundantly supplied with lime or a programme of liming to correct the acidity induced is followed.

Other ammonium salts require more or less attention on account of the tendency to promote soil acidity. Experiments show that ammonium phosphate and ammonium chloride are very similar to ammonium sulphate in this respect; ammonium nitrate and urea are quite mild. Pierre (1928) has shown that the depletion of lime in a soil resulting from the use of urea and ammonium nitrate is only about half that resulting from applications of ammonium sulphate.

In sympathy with the change in productivity the soil shows a chemical change as a result of the continued application of ammonium fertilisers. This change is particularly evident in the light textured, lime deficient soils and is reflected by soil reaction expressed in terms of pH. For the benefit of readers not familiar with the pH scale used to denote the degree of soil acidity, some few words of explanation may be in order.

Soil acidity or, for that matter, any acid condition is due to the presence of hydrogen in the electrified form, known to chemists as hydrogen ions. The concentration of these hydrogen ions (in grains per gallon for instance) is expressed by the pH scale. Hydrogen ions are present in all watery solutions. At the neutral point, as in pure water, the concentration of hydrogen ions, or acidity, is expressed as pH 7. If the solution is alkaline or basic—due, for instance, to washing soda or to lye—the concentration of hydrogen ions will be smaller and will be denoted as pH 10 or some figure higher than pH 7 determined by a special method of weighing the hydrogen ions. If the solution is acid, there will be a large concentration of hydrogen ions and the pH will be smaller than pH 7, say pH 5. Normal soils range from slightly acid to slightly alkaline; from about pH 5.5 to about pH 8.5. Soils which are more acid than pH 5.5 or more alkaline than pH 8.5 are likely to require special treatments in fertiliser and crop practice.

As a result of continued use of ammonium sulphate the soil becomes more acid; that is, the pH value decreases. In the experiments at New Jersey referred to the pH of the soil and subsoil decreased as follows, due to the application of this fertiliser at the rate of 247lbs. per acre for 20 years. The effect of other nitrogenous fertilisers containing an equivalent amount of nitrogen is noted and the results show a tendency to decreased acidity supporting the view that sodium nitrate, calcium nitrate, and cyanamide are physiologically alkaline fertilisers.

Plot.	Treatment.	pH.	
		Soil.	Subsoil.
1	No manure	5.3	5.6
11	Ammonium sulphate	4.8	4.0
9	Sodium nitrate	5.8	5.8
10	Calcium nitrate	5.8	5.7
12	Calcium cyanamide	5.8	5.8

In the sandy soils of the Darling Range even one small dressing of sulphate of ammonia has been found to increase slightly the acidity of the surface three inches of soil.

	Surface soil.
	pH.
Superphosphate only	6.41 (3 samples).
Superphosphate, 28lbs. amm. sulphate/ac. ..	5.76 (6 samples).

The question of the relation of nitrogen fertilisers and soil reaction has been investigated by Pierre (1928). The various fertilisers in the form of heavy dressing were added to soil which was then placed in pots and various crops grown over a period of years. The dose of fertiliser on each pot of soil was repeated each year. Two soil types were used to indicate the effect on a sandy loam as compared with a clay loam. The results are summarised in Table 5.

TABLE 5.

The effect of various Nitrogenous Fertilisers on Soil Reaction.

Source of Nitrogen.	pH Value.			
	Sandy Loam.		Clay Loam.	
	After 1 year.	After 2 years.	After 1 year.	After 4 years.
None	5.35	5.50	6.05	6.03
Sodium nitrate	5.60	6.25	6.25	6.60
Calcium nitrate	5.60	5.75	6.00	6.30
Calcium cyanamide	5.95	6.15	6.25	6.53
Ammonium nitrate	5.10	4.95	5.80	5.48
Urea	5.15	5.00	5.80	5.45
Ammonium phosphate	5.00	4.60	5.70	5.20
Ammonium sulphate	4.45	4.43	5.30	4.80

These experiments afford further evidence that severe acidity is induced by some ammonium salts when applied to soils. Light soils are more seriously affected than heavy soils.

Experiment shows that the various ammonium fertilisers require the following amounts of pure ground limestone or calcium carbonate to correct the acidity developed:—

1lb. ammonium sulphate requires 1.2lbs. calcium carbonate.

An equivalent of nitrogen as—

Ammonium phosphate requires 1.0lbs. calcium carbonate.

“Leuna” saltpetre requires 0.9lbs. calcium carbonate.

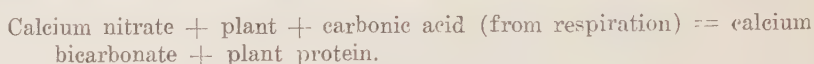
Urea requires 0.6lbs. calcium carbonate.

Ammonium nitrate requires 0.6lbs. calcium carbonate.

It is probable that the benefit of the lime will not be apparent in the early years, but sooner or later its advantage in conjunction with ammonium fertilisers will be apparent.

During the course of their growth plants make heavy demands on the available soil nitrogen and under conditions of intensive cultivation, particularly in

humid regions, applications of nitrogenous fertilisers are economical. Analysis of plants shows that the acidic radicles, such as nitrate and phosphate, are absorbed to a much greater extent than are the basic radicles such as lime and potash. Thus a wheat plant absorbs about three times as much acidic radicle as basic radicle. The behaviour in solution culture substantiates this observation from plants grown in the field, and shows that the nitrate is absorbed greatly in excess of all other radicles. For this reason nitrates are found to be physiologically basic fertilisers. The reaction may be represented as follows, using the base calcium as the example throughout:—



The calcium bicarbonate is a basic constituent which will reduce soil acidity.

When ammonium salts are applied to the soil the nitrifying organisms very rapidly convert the ammonium nitrogen into nitrate nitrogen with the formation of acids.

1. Ammonium sulphate + oxygen + bacteria = 2 nitric acid + sulphuric acid + 2 water.
2. Ammonium nitrate + oxygen + bacteria = nitric acid + nitric acid + 1 water.
3. Ammonium phosphate + oxygen + bacteria = 3 nitric acid + phosphoric acid + 3 water.

These acids attack the lime and other basic compounds in the soil, forming—

Calcium nitrate.

Calcium sulphate.

Calcium phosphate.

As the nitrate is absorbed by the plant leaving the bulk of the lime in the soil, the acidity due to the nitric acid formed is small and is equivalent to the amount of calcium removed by the plant with the nitrate to supply its calcium needs plus the calcium nitrate and bicarbonate removed by leaching.

As sulphate and phosphate are absorbed to a very much smaller extent than nitrate, these acidic radicles are left in the soil, and it is believed that it is these strong acids which are mainly responsible for the depletion of the lime reserves of a soil and are *mainly* responsible for the soil acidity induced by the use of ammonium salts. Not being utilised by the plant to such a large extent as nitrate, the sulphates are removed with calcium by leaching and the phosphates form insoluble compounds in the soil with iron, aluminium, manganese, and calcium. This removes active bases from the soil, leading to acidic conditions.

It is realised that the reaction between the fertiliser and the soil is more complicated than is represented. However, the result of the complex reactions will yield the products mentioned and, for that reason, discussion of them may be omitted in this paper.

CONCLUSIONS.

Certain soil types in Western Australia benefit from an increased supply of nitrogen during the growing season of the crop. The supply may be augmented either by the use of nitrogenous fertilisers or the use of leguminous crops in rotation.

Sodium nitrate is likely to be deleterious after a period of years if used on the heavy alkaline soils of the drier districts. This fertiliser seems better adapted for lighter soils in wetter districts. Calcium nitrate is similar to sodium nitrate in its action and should be excellent under the wetter conditions. It should not have the deleterious effect on heavy soils owing to the lime it contains.

Ammonium salts are best adapted for the heavier textured soils containing adequate lime supplies. On light textured, lime deficient soils continuous use of ammonium fertilisers, particularly ammonium sulphate, ammonium phosphate, and ammonium chloride, leads to severe soil acidity. Ammonium nitrate and urea induce soil acidity but to a much smaller degree.

When ammonium fertilisers are employed on light soils the fertiliser programme must include systematic dressings of lime. The lime is applied once in four or five years in some practices.

Experiment shows that 1 pound of ammonium sulphate requires the application of 1.2 pounds of pure ground limestone or calcium carbonate to correct the acidity induced and to replenish the lime reserves of the soil. Similarly ammonium phosphate, urea, and ammonium nitrate containing nitrogen equivalent to 1 pound of ammonium sulphate require 1 pound, 0.6 pound, and 0.6 pound of pure calcium carbonate respectively to correct the acidity induced.

It is found in practice that nitrogenous fertilisers will not obviate the necessity for good cultural methods or the use of a leguminous crop in a rotation to maintain an adequate supply of soil organic matter or humus.

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LEMON CURING.

GEO. W. WICKENS,
Superintendent of Horticulture.

PICKING.

Gather the fruit when it reaches a diameter of $2\frac{1}{2}$ inches, and while still green or yellowish green. Do not store fruit which is fully yellow and tree ripe.

Each lemon should be clipped (not pulled) from the tree in such a manner as not to remove the "button" and this can best be done by making two cuts—one when severing the fruit from the branch, and another shortening the stem to about one-eighth inch in length before placing in picking box. Great care must be exercised when picking to prevent injury to the skin of the fruit, any abrasion of which is almost certain to result in mould infection.

Do not tip the fruit from a picking box into a sweat box, but handle each fruit separately throughout the operation of gathering and storing; best results will be obtained if the pickers use gloves and the picking boxes are padded.

No lemons should be stored which show skin blemishes from limb rubs, thorns, etc.

SWEATING.

After the fruit is gathered it should be placed loosely in boxes—petrol cases are suitable—and stacked in a well ventilated shed from three to seven days according to weather conditions being dry or damp, so as to allow the fruit to dry off, i.e., "sweat."

STORING.

When sweating is completed the fruit can be stored for curing in several ways, according to the number to be treated and the facilities the grower is able to afford.

Method No. 1.—Wrap each fruit in sulphite tissue paper—apple wraps—and pack loosely in cases lined with paper at bottom and sides and doubled over the top. Stack in a cool dark shed which must not be draughty. If shed cannot be darkened and draughts eliminated, cover the stacks of fruit with canvas sheets or bags, and during the early period of storage raise same occasionally at night,

preventing, as far as possible, great variations in temperature and humidity. Examine the fruit 14 days after storage, removing any showing signs of mould. This can be discerned without unwrapping the lemons. Examine again at later periods, the time of which will vary according to condition of fruit, but if it has been handled with care throughout, very little decay should be found.

Method No. 2.—After sweating, wrap each fruit in sulphite tissue paper. Line the storage cases with paper and pack fruit loosely in these using chaff as a filler as follows:—Just cover the bottom of the case with a layer of chaff, place thereon a layer of lemons; then fill spaces between and cover fruit with a further layer of chaff; then another layer of lemons and so on until case is filled. Stack, handle and examine in shed same as advised for cases packed without chaff.

Method No. 3.—After sweating place the fruit loosely and unwrapped in storage cases lined with paper. Stack cases in a shed free from draughts in blocks of 40 to 50 and cover these with canvas tents. Place a dish of water inside each tent, thus maintaining humidity and preventing excessive shrinkage from evaporation of fruit. If drops of moisture appear on surface of fruit, raise the sides of the tents until moisture has disappeared; then drop again into position. Examine the fruit periodically for mould infection.

Method No. 4.—Underground cellars, if properly constructed, make satisfactory storage places, but require careful attention in preventing moisture from oozing through, or collecting on the walls and floor during winter rains, and an air circulation must be provided, that will allow of gases given off from the fruit being carried out of the chamber. Finally, it must be remembered that no matter what method of storage is adopted none will be successful if the fruit has been bruised or the skins scratched. Gathering the fruit at the right time and avoiding skin injury are essentials in successful lemon curing.

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THE DIPPING OF SHEEP.

HUGH McCALLUM,

Sheep and Wool Inspector.

Parasites in sheep mean an economic loss and if not checked they will quickly result in a widespread deterioration of the State's wool clip.

From some of the clips seen on the Show Floors it would appear that the sheep "tick" is very prevalent in certain districts this season.

Farmers are very fortunate in that with the exercise of care when purchasing new sheep and the annual dipping of their own flocks, they can combat and practically eradicate the parasites "lice" and "tick."

Tick and lice live by sucking the blood from their unfortunate hosts and breed continuously on undipped sheep. Infested animals can be quickly picked out by their poor condition and the appearance of their fleeces. To allay the irritation caused by these parasites the sheep rub themselves along fences or against trees,



Sheep infested with Louse and Tick. Note torn and ragged condition of fleece, due to rubbing.

and often bite at their bodies, until the wool is torn off, leaving raw patches. These patches, in addition to lowering the wool poundage per head, become a menace in that they are attractive to a further serious pest—the blowfly.

For best results dipping should be carried out regularly each season from four to six weeks after shearing. Good standard poisonous preparations are available and the instructions supplied by the makers must be strictly adhered to. On no account must dipping be done during a period of extremely hot or cold weather, or when the animals are thirsty or over-heated from driving. Sheep are better

brought in handy to the dip and given water the evening before. The work should be commenced early on a dry warm day and completed at least two hours before sundown. Every animal put through the dip should be soaked for at least a minute and the head should be once immersed in the solution. This can be done by using a pole with a flat block on the end about 6in.-8in. square, with the corners rounded off. The block prevents injury to the sheep or the fleece when pushing the animal under.

Young lambs can be given only a half-length swim. After dipping, sheep should be held for at least half an hour in a draining pen to prevent the poisonous



Infested sheep, showing typical tufts of wool projecting over the uniform surface of fleece.

solution being dripped out over the pastures. When ewes have suckling lambs, the lambs should be kept apart for a few hours after dipping, but care should be taken to see that they are "mothered" before nightfall.

In districts where small flocks are pastured the cost of putting down individual dips is often rather more than an owner wishes to expend, and can be obviated by owners combining and putting in a community dip, conveniently situated, and sharing the cost.

Owners who have not yet dipped their flocks should give the matter immediate attention.

OWNERS OF BULLS.

Dairy Cattle Improvement Act, 1922.

Attention is drawn to the registration of all bulls over the age of nine months (with the exception of pedigree animals of beef strain) which is due on the 1st January, and must be effected not later than the 21st.

All group settlers whose holdings have been assessed are liable for the registration of the bulls in their possession, and should make application without delay.

The fee payable is 5s. per annum, and should be forwarded with the application form.

SOME OBSERVATIONS ON THE SEASONAL AND REGIONAL INCIDENCE OF BLOWFLIES IN THE SOUTH-WEST OF WESTERN AUSTRALIA.

W.

L. J. NEWMAN, F.E.S., Entomologist,

B. A. O'CONNOR, B.Sc. Agric., and

H. G. ANDREWARTHA, B.Sc. Agric.

With the object of determining what species of blowflies are to be found in this area and their seasonal prevalence, a series of trapping or luring experiments were undertaken. The work commenced April, 1929, and terminated the end of March, 1930.

The area included is shown in the accompanying map, upon which is indicated the rainfall at each station. It represents that portion of the State lying between the 28th and 34th parallels of South latitude and West of the 119th parallel of East longitude.

Very little has been written upon this subject to date.

Blowflies have been received and collected from many districts, but no actual and definite records have been previously published. The blowflies dealt with in this article are those commonly attracted to decaying meat, this being the bait used in all instances. Other flies also were attracted, but are not included.

Method of Collecting Data.—The State Experimental Farms were chosen in each of five tests, these centres being located in or near sheep areas and as evenly distributed as possible, the sixth area being the insectary grounds, Perth, representative of the coastal plain country. The monthly captures of flies were received from the following places:—

Chapman Experimental Farm.

Perenjori Experimental Farm.

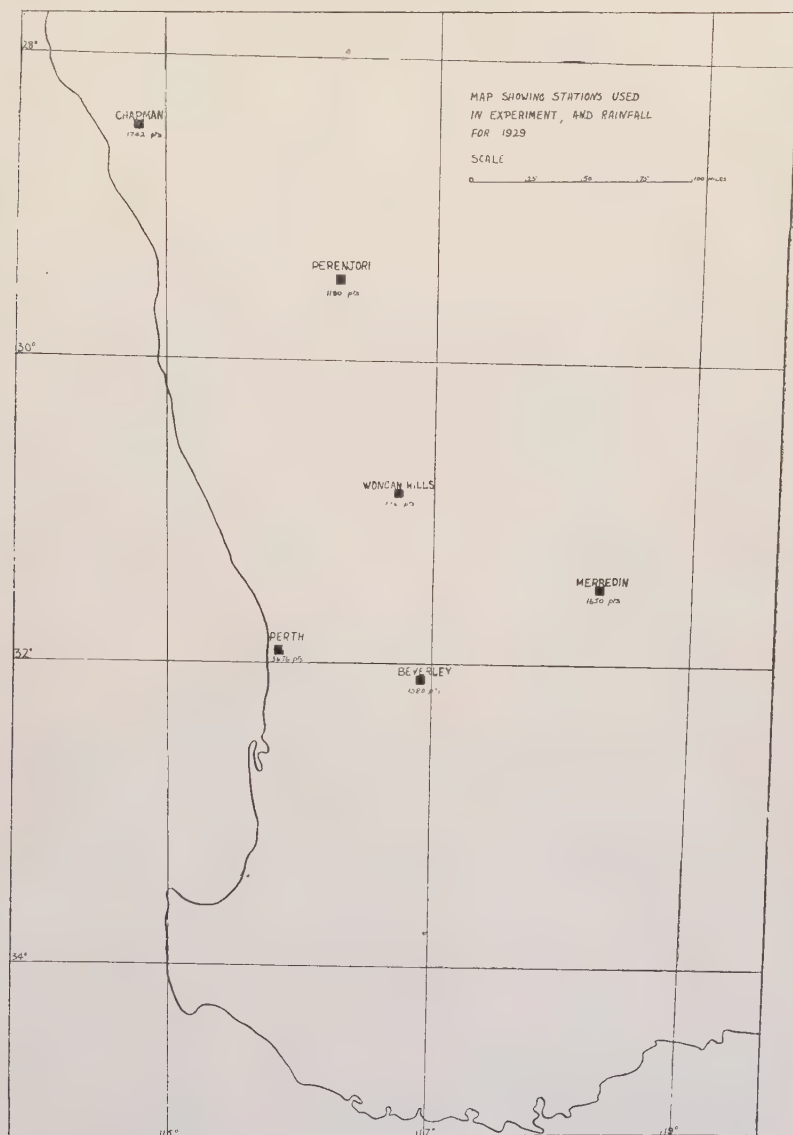
Wongan Hills Experimental Farm.

Merredin Experimental Farm.

Avondale Experimental Farm (Beverley).

Perth Insectary Grounds.

On reference to the accompanying map, it may be seen at a glance where these collecting centres are situated.



Each farm manager who undertook to collect was supplied with a new Western Australian Blowfly Trap (see the Journal of the Department of Agriculture, Western Australia, Volume 3 (Second series) No. 3), together with instructions how to bait and set up and how to collect, pack, and forward the flies. The flies were forwarded regularly each month to the central laboratory, Perth. In one or two instances the catch was one or twice irregular, but the figures herein do afford a fairly correct record of the seasonal, regional, and relative abundance of the flies at different periods of the year. The capture each month was counted, the percentages of each species estimated, and the totals tabulated.

The flies that were determined in this investigation were the following:—*Lucilia sericata* (Meig.); *Chrysomyia rufifacies* (Macq.); *Calliphora australis* (Boisd.); *Microcalliphora varipes* (Macq.), and an undescribed species of *Calliphora* (referred to in this article as *Calliphora* sp.).

All other flies captured were placed under the heading of miscellaneous. These included:—*Peronia rostrata*, *Calliphora erythrocephala*, and several species of *Muscidae* and *Sarcophagidae*.

The following is a superficial description of each of the species of blowflies captured, which, it is hoped, will enable the farmer to recognise them.

Lucilia sericata (Meig.).—The English Blue Bottle. It is a bright metallic green fly often tinged with blue and copper. The body is comparatively slender and somewhat bristly and it rests with its wings making a slightly greater angle to its body than do the wings of the closely resembling blue bottle, known as *Chrysomyia rufifacies*. The eyes are of a brownish red colour and in the case of the female are very widely separated, those of the male being slightly closer. The larva or maggot of this fly is smooth.

Chrysomyia rufifacies (Macq.).—Commonly known as the Banded Blue Bottle Fly. This fly is larger and more robust than the preceding one. Its prevailing colour is a bright shining green tinged with blue. The edges of the thoracic and abdominal segments are darker in colour than their central portions, giving the fly the characteristic transversely banded appearance, from which it derives its common name. The abdomen is more rounded than that of *Lucilia sericata*. The wings, when at rest, also lie more parallel to and over the body. The eyes are more globular than those of *Lucilia*, but of much the same brownish red colour. The female eyes are not so widely separated and those of the male are almost touching. The larvae or maggot is easily recognised; it is not smooth and white, but has the whole surface of the body covered with rows of protuberances, at the ends of which are set tufts of short spines. This gives it a characteristic hairy appearance, hence it is generally referred to as the hairy maggot.

Microcalliphora varipes (Macq.).—The smaller Banded Bluebottle Fly. Superficially this fly resembles *C. rufifacies* in its colour and the banding of the abdomen. It is less than half the size of either the previously mentioned flies. The eyes of both male and female are widely separated. It has a similar hairy maggot of about half the size of *C. rufifacies*.

Calliphora australis (Boisd.).—The Golden Winter Blowfly. This is a large, thickset, yellow, heavy blowfly. It closely resembles *Calliphora stygia* (Fabr.) and *Calliphora Hilli* (Patton), Eastern State forms, which have not yet been definitely proved to be present in Western Australia. It differs from *C. stygia*, in not having the facets of the upper half of the multiple eyes of the male enlarged. From *C. Hilli* it can be separated by the form of the hypopygium of the male and in having the eyes of the male more widely separated. The larva is a thickset smooth maggot.

Calliphora sp. (Nov.).—This resembles both *C. Augur* (Fab.), with which it was originally confused, and *C. centralis* (Mallock), but differs from both. It is less hairy, its abdomen is a clear honey yellow, except for a bright metallic blue-violet patch (larger than that found upon *C. Augur*), which occupies most of the posterior and dorsal sections of the abdomen. It further differs in having three pairs of presutural acrostichal bristles and in having a blue-violet central mark on the abdomen, instead of a blue-green. The dusting on the fourth



- 1 *Lucilia sericata* (English Bluebottle). Male. X 2.
- 2 *Lucilia sericata* (English Bluebottle). Female. X 2.
- 3 *Calliphora australis* (Golden Winter Blowfly). Male. X 2.
- 4 *Calliphora australis* (Golden Winter Blowfly). Female. X 2.
- 5 *Chrysomya rufifacies* (Banded Bluebottle). Male. X 2.
- 6 *Chrysomya rufifacies* (Banded Bluebottle). Female. X 2.
- 7 *Calliphora* sp. Male. X 2.
- 8 *Calliphora* sp. Female. X 2.
- 9 *Microcallephora varipes* (Lesser Banded Bluebottle). Female. X 2.

tergite is white instead of yellow. It differs also from *C. centralis* in the colour of the central portion of the abdomen and in the dusting on the fourth tergite. The larva or maggot is smooth.

We have now accounted for the blowflies captured during this survey. A study of the accompanying tables will show that there is a great disparity in the relative abundance of the several species in the different districts and seasons or months of the year.

Chrysomya rufifacies, the Banded Blue Bottle Fly, is the predominating one in all districts throughout the warmer months (September to April). It is either completely absent or very scarce during the colder months of May to September. Its numbers show a marked increase in the spring, usually about September, and continues to rise to a peak period in January. It then begins to decrease and reaches its minimum in the winter. This fly is relatively slightly more plentiful in the inland districts. Taking it generally, however, it is the most uniformly distributed of all the species examined.

Lucilia sericata, or Common Blue Bottle Fly. This is plainly shown by the tables to be in the main a coastal fly. It is never numerous at Perenjori, Merredin, Beverley, or Wongan Hills, a few being recorded there during the spring and early summer. At Perth, which represents coastal country, this fly is present every month of the year. It reaches its peak in the mid-winter months and is at its minimum in mid-summer. It never constitutes less than 15 per cent. of the total blowflies captured. At the Chapman State Farm, the only other coastal station in this test, some 300 miles north of Perth, *Lucilia sericata* was numerous in the spring and early summer months, but completely absent in the late summer and autumn.

Calliphora australis appears to be the worst sheep maggot fly that we have. It is a winter and spring pest. It was found to be present at all the stations where the captures were made, but was most numerous at Beverley. It is completely absent during the summer months (December to March) at all stations except Perth. It makes its appearance in May and gradually works up to its maximum in August-September and dwindles away to its minimum in mid-summer.

Calliphora sp. nov. This apparently new species is mostly an inland fly. In Perth we never found more than a trace of it. The tables show it to be present throughout the year at Merredin and Wongan Hills. It is most numerous in the winter and early spring, becoming less active and fewer in numbers as the summer approaches. In most places it disappears entirely in the summer, appearing again in April or May, according to season, but as before mentioned is always present in small numbers throughout the summer in the Wongan Hills and Merredin districts.

Microcalliphora varipes is present at all of the stations for nine months of the year, disappearing during winter. It reaches its maximum in the autumn, dies down to its minimum in mid-winter, and rises again in the spring and summer.

PERTH INSECTARY.

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Total Blow-flies caught.	Miscellaneous larvae.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.			
April	10,837	40.3	37.47	5,900	21.9	20.38	...	...	...	739	2.7	2.55	9,502	35.1	32.8	27,978	2,022	29,000
May	6,171	94.8	85.7	228	3.5	3.2	...	...	...	114	1.7	1.6	...	...	...	6,513	687	7,200
June	2,734	92.2	52.6	94	3.1	1.8	...	...	...	94	3.1	1.8	...	...	...	2,931	2,231	5,200
July	912	81.3	25.7	...	...	...	...	...	...	170	15.3	4.8	...	...	...	2,432	2,432	3,553
Aug.	892	55.1	27.1	...	...	...	...	...	...	720	44.4	21.9	...	...	...	1,121	1,121	3,285
Sept.	10,098	68.0	30.6	693	4.8	2.1	...	...	...	3,663	24.8	11.1	...	...	...	1,620	1,665	33,000
Oct.	8,772	50.0	20.4	2,021	11.4	4.7	...	...	...	6,192	34.8	14.4	...	...	...	14,784	18,216	33,000
Nov.	13,400	20.9	10.0	4,210	65.2	31.5	...	...	...	6,773	7.8	3.8	...	...	...	17,558	25,442	43,000
Dec.	15,397	24.2	17.3	40,673	64.7	45.7	...	...	...	5,082	7.8	3.8	...	...	...	64,578	69,422	134,000
Jan.	2,260	15.6	11.3	11,260	78.1	56.3	...	...	...	890	1.5	1.0	...	...	...	62,743	26,255	89,000
Feb.	5,076	46.0	42.3	4,884	44.2	40.7	...	...	...	100	...	...	...	...	...	14,440	5,560	20,000
March	5,852	15.3	13.3	11,000	28.7	25.0	...	...	...	...	...	...	21,296	55.6	48.4	38,280	5,720	44,000

MERREDIN EXPERIMENT FARM.

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Total Blow-flies caught.	Miscellaneous larvae.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Flies.			
April	200	3.8	1.0	2,400	46.1	12.0	300	5.9	1.5	...	...	...	2,300	44.2	11.5	5,200	14,800	20,000
May	21	2.1	1.2	299	29.1	17.0	450	43.8	25.6	...	...	...	170	16.6	9.7	1,026	734	1,760
June	49	2.3	0.7	...	...	...	1,778	77.3	25.4	...	...	...	105	4.4	1.5	2,296	4,704	7,000
July	...	1.9	...	...	...	...	191	62.0	43.7	...	...	...	...	...	...	308	129	437
Aug.	...	...	...	721	11.4	10.3	3,465	56.0	49.5	...	...	...	...	...	...	6,223	777	7,000
Sept.	1,080	6.4	4.8	6,000	36.5	27.3	7,680	47.6	34.9	...	...	...	...	...	...	19,849	5,660	25,500
Oct.	2,739	13.8	8.3	10,164	51.2	30.8	6,567	33.2	19.9	...	...	...	...	...	...	19,849	13,101	33,000
Nov.	150	2.0	1.5	5,500	74.3	55.0	1,650	22.3	16.5	...	...	...	...	...	...	7,400	2,000	10,000
Dec.	420	4.6	3.8	7,392	80.8	61.6	552	6.1	4.6	...	...	...	...	...	...	10,032	1,968	12,000
Jan.	45	1.9	1.3	2,034	80.5	58.1	115	4.6	3.3	...	...	...	...	...	...	2,520	980	3,500
Feb.	...	...	...	665	73.4	66.5	25	2.8	2.5	...	...	...	215	23.8	21.5	2,905	95	3,000
March	...	...	...	1,820	80.2	65.0	196	8.7	7.0	...	...	...	252	11.1	9.0	2,298	532	2,800

DAMPAWAH EXPERIMENT FARM (PERENJORI).

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Miscellaneous.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Total flies caught.		
April	...	...	...	17,100	64.5	57	2,400	9.2	8.0	...	1.2	...	6,900	26.3	26,400	3,600	30,000
May	...	...	...	14,040	39.0	39.0	12,600	35.0	35.0	432	1.2	...	8,928	24.8	36,000	...	36,000
June	...	...	...	840	12.2	10.5	4,344	62.6	54.3	992	14.3	12.4	760	10.9	6,936	1,064	8,000
July	...	...	...	74	0.6	1.5	7,652	64.5	58.9	3,417	28.7	26.3	668	5.6	11,885	1,115	13,000
Aug.	...	0.6	...	504	1.5	...	24,516	74.4	68.1	7,128	21.7	19.8	510	2.4	35,748	252	36,000
Sept.	...	...	...	14,900	28.7	23.8	19,000	36.0	29.9	12,400	27.7	...	5,100	9.6	51,600	10,400	62,000
Oct.	...	...	...	32,760	70.5	54.6	13,240	38.7	25.4	...	...	...	3,660	6.7	52,680	7,320	60,000
Nov.	...	...	...	11,700	70.5	55.8	3,640	22.0	18.2	...	...	...	740	1.7	13,860	4,140	20,000
Dec.	...	...	...	5,670	80.7	63.0	315	4.6	3.5	...	...	...	990	14.0	7,029	1,971	9,000
Jan.	...	...	...	861	82.5	53.4	5	...	...	...	...	...	165	16.5	976	524	*15,500
Feb.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	6,128	46.0	38.3	...	...	...	...	...	...	7,200	54.0	13,328	2,672	16,000

* There were five C. erythrocephala in total.

† Only 19 flies caught.

WONGAN HILLS EXPERIMENT FARM.

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Miscellaneous.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Total flies caught.		
April	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	75	20	0.4	150	40	...	...	...	...	...	...	...	...	...
June	...	...	...	1	0.6	0.3	114	53.0	32.3	...	...	...	...	...	...	...	3,750
July	...	...	...	221	2.7	1.3	4,199	41.9	24.7	100	28.3	...	...	...	...	...	353
Aug.	...	2.7	...	2,470	26.3	6.5	3,724	40.0	9.8	5,372	52.7	31.6	...	...	...	...	17,000
Sept.	...	1.3	0.3	3,870	45.4	12.9	3,810	44.5	12.7	2,888	31.1	7.6	114	1.3	10,013	6,987	38,000
Oct.	...	6.7	...	9,333	67.5	18.66	2,833	20.5	5.66	...	...	...	270	3.4	9,540	28,690	36,000
Nov.	...	8.4	...	10,846	78.7	13.9	1,131	8.3	3.9	...	...	...	500	3.6	13,667	24,890	38,000
Dec.	...	3.0	...	540	54.0	18.0	30	3.0	1.0	1,769	10.1	6.1	1,769	10.1	13,152	34,333	50,000
Jan.	...	...	...	3,600	53.6	30.0	240	3.6	2.0	...	...	...	2,880	42.8	7,000	15,848	29,000
Feb.	...	...	...	6,750	52.0	33.75	500	3.8	2.5	...	...	...	5,750	44.2	6,720	2,000	3,000
March	...	...	...	...	...	...	...	...	...	...	...	...	...	...	13,000	7,000	20,000

CHAPMAN EXPERIMENT FARM.

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Total Blow-flies caught.	Miscellaneous.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.			
April	...	...	...	675	75.0	67.5	...	...	...	...	...	...	225	25	22.5	900	100	1,000
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	88	6.7	6.6	44	3.5	3.4	1,122	87.2	85.2	11	0.8	0.8	22	1.8	1.7	1,287	33	1,320
Aug.	58	1.4	1.3	406	11.9	10.9	3,627	82.2	80.6	232	5.5	5.3	...	...	...	4,383	117	4,500
Sept.	1,290	11.9	8.6	3,645	34.8	24.3	4,185	38.8	27.9	300	2.9	2.0	1,215	11.6	8.1	10,635	4,365	15,000
Oct.	3,984	50.7	33.2	2,796	35.6	23.3	...	10.6	6.9	...	...	...	240	3.1	2.0	7,848	4,152	12,000
Nov.	2,500	31.9	25.0	4,330	55.3	43.3	...	...	...	...	...	...	1,000	12.8	10.0	7,830	2,170	10,000
Dec.	14	9.1	3.6	106	66.6	26.5	...	...	...	...	...	...	39	24.3	9.6	159	466	400
Jan.	...	...	...	3,033	46.4	43.3	...	...	...	...	...	...	3,500	53.6	50.0	6,534	...	7,000
Feb.	...	...	...	3,235	64.7	64.7	...	...	...	...	...	...	1,765	35.3	35.3	5,000	...	5,000
March	...	...	...	3,840	31.6	24.0	...	...	...	...	...	...	8,320	68.4	52.0	12,160	3,840	16,000

AVONDALE EXPERIMENT FARM (BEVERLEY).

Month.	Lucilia sericata.			Chrysomya rufifacies.			Calliphora sp.			Calliphora australis.			Microcalliphora varipes.			Total Blow-flies caught.	Miscellaneous.	Total Flies.
	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.	No. caught.	Percent- age of Total Blow- flies.	Percent- age of Total Blow- flies.			
April	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Aug.	...	...	...	...	...	...	370	8.7	7.4	3,935	91.3	78.7	...	...	...	4,305	695	5,000
Sept.	...	...	...	330	3.0	...	2,750	25	25	7,920	72	72	...	...	...	11,000	...	11,000
Oct.	56	1.0	7	1,480	26.5	18.5	1,880	33.5	23.5	2,184	39.0	27.3	...	...	...	2,400	2,400	8,000
Nov.	...	...	...	7,605	70.8	39.0	2,632	24.5	13.5	370	3.4	1.9	136	1.3	.7	10,743	8,757	19,500
Dec.	...	...	...	9,600	93	64	420	4.1	2.8	...	...	...	300	2.9	.2	10,320	4,680	15,000
Jan.	...	...	...	3,125	90.9	62.5	...	...	...	...	...	...	315	9.1	6.3	3,440	1,560	5,000
Feb.	...	...	...	2,835	67.7	56.7	180	4.4	3.6	...	...	...	1,165	27.9	23.3	4,180	820	5,000
March	...	...	...	3,000	65.9	60.0	333	7.3	6.7	...	...	...	1,220	26.8	24.4	4,553	447	5,000

Having determined the species of blowflies found in these areas, we are now endeavouring to discover the flies mainly responsible for the blowing of the sheep. To this end, we desire those interested to collect larvae from infested sheep and forward to this Department for breeding out and determination.

During the progress of the work to date, we have found that *C. australis* is the prevailing and most active sheep maggot fly.

Another interesting fact was the rearing of this fly from maggots infesting cow droppings. Whether this is more or less accidental, has yet to be proved.

A further useful feature disclosed was the effectiveness of trapping. Enormous numbers of flies were captured at each farm.

We wish to thank the Superintendent of the Experimental Farms and the Farm Managers for their great interest and assistance in attending to the traps and the forwarding each month of the captures, and Dr. Mackerras, Entomologist, Council for Scientific and Industrial Research, for kindly determining the flies.

BORDEAUX MIXTURE.

Simple Directions for its Preparation in either Small or Large Quantities.

H. A. PITTMAN, B.Sc.Agr.,
Plant Pathologist.

Ever since the discovery by Millardet of the strong fungicidal (fungus-killing) properties of a mixture of lime and bluestone—as a result of his chance observation in 1882, in the Bordeaux district of France, of the protective action of such a mixture against the dreaded “downy mildew” (*Plasmopara viticola*) of the grape—the mixture known as “Bordeaux” has been the leading spray material all over the world wherever fungous diseases have had to be combatted.

Although to some extent superseded of late years by Lime-Sulphur, especially as a summer spray on apples and stone fruits, and by such other substances as “dry-mix sulphur-lime,” “atomic sulphur,” “sulphur dust,” “copper-lime dust,” “copper carbonate-sulphur dust,” etc., for certain diseases, it still remains “. . . the most widely known and the most generally useful of all spray liquids employed against parasitic fungi” (1).

GOOD QUALITIES OF BORDEAUX MIXTURE.

The great and lasting popularity of Bordeaux Mixture as a spray for the vine, and for most orchard, vegetable, and flower-garden plants, may be attributed very largely to its following good qualities:—

1. When properly prepared, it is remarkably adhesive to most types of stems, fruits and foliage. After it has once dried on the plant it can only be slowly removed by rains, dews, or other climatic influences.
2. It has a very high efficiency in preventing infection of the above-ground parts of plants by most types of fungi.
3. The cost of the ingredients required to make quite a large volume of spray is relatively low.

4. When used at the ordinary strength, it is quite harmless to most types of cultivated plants.
5. It has a decidedly tonic effect on the growth of most plant species, quite apart from its fungicidal action.
6. It is quite simple to prepare and safe to handle.

DRAWBACKS TO THE USE OF BORDEAUX MIXTURE.

1. Its main disadvantage is that the bluestone (copper sulphate), which is one of the essential ingredients, will speedily corrode iron or steel and all the other commonly-used metals or alloys except copper, brass or bronze. This difficulty is usually overcome, in practice, by dissolving the bluestone in wooden tubs or casks, and by using bronze, brass, or porcelain-lined spraying equipment and accessories. On a small household scale the copper sulphate may be dissolved in copper, brass, bronze, glass or earthenware vessels.

2. Another disadvantage is that Bordeaux Mixture has been found very apt to cause injury to the leaves and fruit of apple and most kinds of stone-fruit trees (especially peaches and Japanese plums), if applied in the spring or summer *after* the "spur-bursting" or "bud-bursting" stage. To overcome this disability in the case of apples, only very weak strengths and an excess of lime are recommended from the "pinking" stage onwards, or "lime sulphur" may be substituted for the later sprays.

Bordeaux Mixture should only be applied to plants liable to be injured by the spray during warm, dry weather, as injury is most likely to occur if the spray is used during, or just preceding, dull, humid, slow-drying climatic conditions. The addition of an efficient spreader (see section on spreaders near the end of this article) will also tend to lessen the danger of russetting the fruit or causing leaf injury. Further information *re* using Bordeaux Mixture as a spray for apples after the "spur-bursting" stage will be found on pages 254-263 of the June issue of this Journal for 1930, or on pages 17-23 of Department of Agriculture Bulletin No. 306, entitled "Black Spot or Scab of Apples and Pears in Western Australia."

There is no difficulty in this State so far as Bordeaux injury to stone fruits is concerned, inasmuch as all the fungous diseases which occur here, as yet, on such plants, can be readily controlled by spraying with Bordeaux Mixture in the winter, or just as the buds are bursting in the spring, or, in addition, as the leaves are falling from the trees in the autumn, as the case may be. If these sprayings are carried out efficiently, there is, at present, no necessity for the summer spraying of stone fruits in this State. Should such a necessity arise in the future, due to the outbreak of some otherwise uncontrollable parasite, "dry-mix sulphur lime" or "self-boiled lime-sulphur" could be used as convenient and harmless summer sprays.

3. The only remaining serious objection to the use of Bordeaux Mixture is that it imparts a bluish colouration to sprayed plants, so that it is sometimes considered unsightly on ornamental or flower-garden subjects, and it cannot, of course, be used on produce just prior to marketing. For this latter purpose, ammoniacal copper carbonate or very dilute Burgundy mixture (1-1½-50) should be used instead.

HOME PREPARATION OF BORDEAUX MIXTURE ADVISABLE.

Many farmers, orchardists, vignerons, vegetable-growers and home-gardeners in this State are under the erroneous impression that Bordeaux Mixture is difficult to prepare, and, in consequence, obtain their Bordeaux as a powder already mixed.

Numerous experiments the world over have indicated that commercial Bordeaux Mixtures are not as effective, or as adhesive, as the freshly-prepared, properly-made, home-made mixture. Considerable burning of fruit and foliage has sometimes followed the use of commercial Bordeaux powders in this State. Mason, in his "Spraying, Dusting and Fumigating of Plants" (3), writes, "Bordeaux Mixture is the one spray which, if used in any considerable quantities, should always be made on the farm, the commercial forms being of less value than the freshly-made products."

FORMULAE FOR MAKING BORDEAUX MIXTURE.

The formula in most general use, at the present time, for most vegetable, flower-garden and fruit plants, is that known as "4-4-50." This means 4 lbs. of bluestone and 4 lbs. of "freshly-burnt," "stone," or "quick" lime to every 50 gallons of the mixture.

This standard formula may be varied, so as to allow for a greater or less proportion of bluestone to lime, according as experience indicates to be necessary for the control of a particular disease and the avoidance of spray injury to the species of plant concerned. Thus 6-6-40 is used in Western Australia for the "bud-bursting," "pre-blossoming" and "fruit set" sprayings of the vine against "Anthracnose" (*Gloeosporium ampelophagum*), but later sprayings, if required, are given at 6-6-50, and I consider 2-5-50 all that would be permissible or necessary here for the summer spraying of apples against "black spot," should that disease become at all widespread (see Department of Agriculture Bulletin No. 306).

In all formulæ for the preparation of Bordeaux Mixture the first figure given is the number of pounds of bluestone, the second figure is the number of pounds of "freshly-burnt," "quick" or "stone" lime, and the final figure indicates the full number of gallons to which the mixture must be made up with water prior to spraying.

DIRECTIONS FOR PREPARING BORDEAUX MIXTURE IN SMALL QUANTITIES FOR HOME GARDENS.

A small quantity of Bordeaux Mixture of very nearly 4-4-50 formula (actually 4-4-48) can be prepared by taking:—

(1) 4 ozs. bluestone,

(2) 4 ozs. "freshly burnt," "stone," or "quick" lime,

and making up to a final volume of 3 gallons as indicated below:—

a. Dissolve the bluestone in a wooden tub or wooden barrel, or a copper, bronze, brass, glass or earthenware vessel, using $1\frac{1}{2}$ gallons of water. The bluestone may be dissolved by suspending it overnight in the water in a piece of hessian, bagging or linen, from a stick placed across the mouth of the receptacle; or by heating the water and pouring it over the bluestone in the bottom of the receptacle, if the mixture is required in a hurry.

b. Slake the quick-lime, which must be quite fresh and of good quality, in another container, by adding water a little at a time. A small wooden cask is convenient, but, unlike the bluestone, an iron vessel such as a clean empty kerosene tin may be used in which to slake the lime. When slaked, make up to $1\frac{1}{2}$ gallons with water. This suspension and partial solution of lime in water is known as "milk of lime."

c. Pour the two liquids simultaneously through a copper, brass or bronze wire strainer into the spray outfit, or into a wooden or other non-corrosible container, and, after seeing that the volume is exactly three gallons, use immediately.

An alternative method is to first strain the milk of lime into the spray outfit through a piece of bagging to remove any gritty particles or lumps which might clog the sprayer, and then pour in the bluestone solution, keeping the milk of lime well agitated while doing so. See that the final volume is correct and commence to spray immediately.

The bluestone solution and the milk of lime can be kept indefinitely, so long as they are kept separate and any evaporated water is replaced to each before using; but once they have been added to each other the spraying must be commenced immediately and continued until all the spray is used up, as Bordeaux Mixture soon deteriorates if left standing about after being made up.

Another important point to bear in mind is never to mix the solid lime and bluestone together before adding the water. The more dilute each constituent is before meeting the other, the better.

STOCK SOLUTIONS AS A MEANS OF REMOVING THE DRUDGERY FROM THE FREQUENT PREPARATION OF BORDEAUX MIXTURE.

It rarely happens that a single spraying is sufficient to control a disease in plants. Even in those cases where a single spraying carried out at the right time does suffice, as with "Shot-hole" of stone fruits in many places, the orchardist usually find that the different varieties are not all ready for spraying at the same time. This usually means that the spraying period is protracted and the grower becomes impatient at having to continually make up "from scratch" a fresh lot of spray. Frequently, also, a grower finds, on going to use his quicklime, that it has become air-slaked, with the result that a new lot of quicklime must be ordered for delivery in a hurry, with consequent fraying of tempers and the possibility of a lot of damage being done by disease, in the meantime, before the new lot arrives. A certain amount may be used out of the new consignment, and again deterioration may take place by the time the remainder is required.

Difficulties of the above nature may be readily avoided if the growers will only appreciate the following facts:—

Although, when once prepared, Bordeaux Mixture must be used immediately, the separate ingredients, i.e., the bluestone and the lime, can be kept in concentrated form in water for very long periods without deterioration taking place, and ready for use at a moment's notice.

METHOD OF MAKING UP THE STOCK SOLUTIONS.

The procedure is as follows:—

1. Work out approximately how much bluestone and lime will be required to carry out your spray programme. (It usually takes about 2 gallons of liquid to spray a well-grown apple, stone-fruit or citrus tree in this State for the control of fungous diseases, and anything from 100 to 150 gallons to cover one acre of vegetable crops such as almost fully-grown potatoes. Various factors will tend, however, to vary the amount required, and the experienced grower will know best just how much he will need for a particular area or job.)

2. Then dissolve the bluestone in water in wooden casks or other non-corrosible containers at the rate of 1 lb. to every gallon of water.

This can best be done by suspending the bluestone over-night, in a sugar bag or cut-down chaff bag, from a stick placed across the mouth of the cask and so arranged that the bluestone is just beneath the surface of the water. If wanted in a hurry, the crystals can be fairly readily dissolved by pouring hot water over them at the rate of about 2 gallons of hot water to every 6 lbs. of bluestone.

3. Slake the "freshly burnt," "stone" or "quick" lime in other containers at the same rate as the bluestone, i.e., so that each gallon of the concentrate contains in it one pound of quick-lime. This is done by adding water, a little at a time, until all the lime is slaked, and then bringing the water level up to the required height in the containers. Iron vessels are quite suitable to make the lime concentrate in, but wooden casks are generally used.

The New South Wales Department of Agriculture has carried out a series of experiments and finds that lime may be stored under water even for periods of twelve months. There is a slight decrease in the effective lime amounting to about $\frac{3}{4}$ per cent., but this decrease is so slight as to be negligible (4).

Only a little of the lime actually goes into solution, the major portion eventually sinking to the bottom of the container.

To check evaporation, a few drops of lubricating oil (not spraying oil) may be placed on the surface of each concentrate, and a mark should be made at the surface of each lot when it is finished with for the time being, so that any water which has evaporated may be replaced before using it again. Covers could also be placed over concentrates to prevent animals or children interfering with them, and they should be protected from rain, dust-storms, etc., when not in use.

PROCEDURE TO BE FOLLOWED WHEN MAKING THE BORDEAUX MIXTURE FROM THE CONCENTRATES.

There are two alternative methods which may be used for making the Bordeaux Mixture from the concentrates.

The first method is the simpler, but does not give quite as good a spray mixture as the second. The second method gives the best possible mixture, but involves the use of a little more equipment than the first.

FIRST METHOD.

a. Stir the lime concentrate thoroughly, being especially particular at the sides and corners of the container, so as to get a uniform distribution of the lime in the water, and, when thoroughly well mixed, dip out the full amount required, remembering that, when well stirred, each gallon of lime concentrate contains the equivalent of one pound of quick-lime. Pour the lime into the spray tank through a piece of bagging, or, better still, a fine wire sieve containing 16-18 meshes to the inch, to remove any gritty or coarse particles which might tend to block up the spraying equipment. (A copper, brass or bronze wire sieve is the best, as it can then also be used for the bluestone when the time comes.)

If 3-4-50 Bordeaux was being prepared, for example, and it was proposed to make 50 gallons, it is obvious that 4 gallons of lime concentrate would be required to be sieved into the spray tank, the lime requirement being always the second figure in the formula.

b. After sieving the lime concentrate into the spray tank, add water to the tank until it contains about three-quarters of the total volume of spray to be made; i.e., in the specific case under consideration, fill up the tank to about 40 gallons.

c. Set the agitator going and strain in the required amount of bluestone concentrate, remembering again that each gallon of bluestone concentrate contains 1 lb. of solid bluestone.

For the 3-4-50 formula being discussed, then, we would need 3 gallons of bluestone concentrate to be sieved through the brass, copper or bronze sieve into the agitated and diluted lime in the spray tank. (There should really be no need to sieve the bluestone solution, except that small pieces of straw, etc., which might block up the sprayer, might have been blown into the solution during the storage period.)

d. We have now arrived at the stage where about 43 gallons of liquid, containing a light-blue flocculent precipitate, are in the spray tank. If a spreader is to be used, it should now be added, and then the volume finally be brought up to 50 gallons with the necessary amount of water.

Use the Bordeaux Mixture immediately, if possible, but if, for any unforeseen reason, it has to be kept standing for some time before use, first add to it one-eighth of an ounce of table sugar (cane-sugar) for every pound of bluestone which has been used. In the example being considered, $\frac{1}{8}$ oz. $\times 3 = \frac{3}{8}$ oz. of table sugar would need to be used. The table sugar prevents the deterioration of the flocculent (flake-like) blue precipitate to which the Bordeaux Mixture owes its desirable qualities. (One heaping tablespoonful of table sugar equals one ounce.)

SECOND METHOD:

This method is preferable to the first, but necessitates two extra containers. The underlying principle is that the ideal Bordeaux Mixture can only be prepared if both the lime and bluestone concentrates are diluted as much as possible (i.e., in each case to half the total volume of the Bordeaux to be made) before running them together simultaneously through the brass, bronze or copper wire strainer into the spray tank.

In the case of the 3-4-50 formula under discussion, for example, 3 gallons of bluestone concentrate are diluted to 25 gallons, with water, in a second wooden barrel or other suitable container. Four gallons of lime concentrate are similarly diluted in a wooden or iron container to 25 gallons, and then both lots of the diluted materials are run together simultaneously through the non-corrosible sieve into the spray tank, by means of taps and rubber hoses let into the bottoms of the dilution vessels.

AN ELEVATED STAND VERY CONVENIENT.

For the most convenient preparation of Bordeaux Mixture a wooden stand should be erected handy to an overhead water tank or other source of water supply. The vessels to hold the concentrates and the diluted ingredients are placed on the stand, which is built of such a height that the tank on the spray outfit can be conveniently filled by the force of gravity. In this way all heavy lifting is obviated, the only liquids requiring to be lifted being the small quantities of concentrates required for every 50 gallons of mixture. Instead of a wooden stand a vertical cut through a hillside or earth bank may be made to allow the spray equipment to pull up in front of, but below the level of, the mixing site.



Fig. 1.—A good type of elevated stand for the preparation of Bordeaux Mixture and the convenient filling of the spray outfit. Stock solutions may be diluted in the two central barrels on the lower platform, and run into the spray tank through a large pipe and hose extending out from between the barrels. The stock solutions of copper sulphate (bluestone) and lime may be kept in other barrels on the lower platform, or in two large barrels on the top platform. It is better if the top platform is reserved for the water supply, which may be held in large barrels or an iron tank. If an iron tank (galvanised or otherwise) is used to hold the water supply, care should be taken that it is not splashed with the bluestone solution, or, better still, it should be well protected on the outside with good quality paint or tar to prevent corrosion.

(After Mason, "*Spraying, Dusting and Fumigating of Plants.*")

PURITY OF THE INGREDIENTS ESSENTIAL.

The bluestone bought should be of at least 98 per cent. purity. It should be in the form of large dark-blue crystals, and should not contain any appreciable amount of the greenish-coloured sulphate of iron which is sometimes met with in commercial samples of bluestone. It may be tested by dissolving a small quantity in water, diluting this with extra water in a tumbler until it becomes a light-blue colour, adding a little ammonia and then stirring well. A pale-blue precipitate of copper hydrate is first formed, but this quickly dissolves, if enough ammonia is present, to give a very intense violet-blue colour. The formation of a reddish-coloured precipitate or sediment indicates the presence of iron.

With reference to the lime used for the preparation of Bordeaux Mixture, it is of extreme importance that the lime should be freshly burnt. To test whether this is so, or to see if it has become to any extent water- or air-slaked, a few lumps should be placed in a heap and sprinkled with water. Freshly-burnt lime will become very hot, give off a quantity of steam, gradually fall to pieces and crumble to a fine white powder. Some lime will not do this readily with cold water, but may do so if hot water is used. If the lime does not get hot enough to give off steam, even with hot water, it is unsuitable.

Water-slaked lime may be used, provided that it has only been slaked a day or two at the most, and that the correct adjustment is made to the formula. If using fresh water-slaked lime, increase the lime content of the formula by one-third to one-half extra. Air-slaked lime cannot be used under any circumstances.

In practice the best procedure is to very definitely specify "freshly-burnt" lime when ordering, and then to slake it immediately on its arrival and keep it under water until required, as described in a preceding section of this article.

TESTS FOR BORDEAUX MIXTURE.

Bordeaux Mixture is said to owe its valuable fungicidal properties to a basic copper sulphate from which the ordinary copper sulphate is reformed in very small quantities from time to time. These quantities are too small to harm the tissues of most plants, but are yet quite sufficient to kill the germinating seed bodies (*spores*) of harmful fungi. If, by some mischance, there should happen to be too little lime in the Bordeaux Mixture to completely turn the bluestone into the insoluble basic sulphate, considerable injury could be caused to any plants sprayed. While there should be very little likelihood of this happening if ordinary care is taken, each lot of Bordeaux Mixture made up should be tested, before using, in one or other of the following ways:—

Take a little of the Bordeaux Mixture in a glass vessel, add a few drops of acetic acid, and then add a few drops of a solution of ferrocyanide of potassium in water. (The strength of the ferrocyanide should be 4 ozs. in one pint of water. Both the ferrocyanide and the acetic acid are obtainable from any chemist.) Should any brown discolouration occur, the Bordeaux Mixture does not contain enough lime, and more lime concentrate must be added, until, on further testing, no discolouration is apparent.

A rough but useful test which can be made to see if the Bordeaux contains enough lime to neutralise the bluestone, is to dip the clean blade of a pen-knife, or a bright piece of iron such as a shiny nail into the mixture for several minutes. If the mixture does not contain sufficient lime, a reddish-brown deposit of copper will form on the iron and more lime should be added. *Always use a little too much lime rather than a little too little*, as quite a considerable excess of lime may be used without the fungicidal properties of the spray being markedly lowered.

THE USE OF SPREADERS WITH BORDEAUX MIXTURE.

Whenever Bordeaux Mixture is used, the spreading, wetting, and adhesive qualities of the spray will be very greatly improved by the incorporation of a special spray "spreader" or "sticker." In addition, the spray, on drying, will settle down into a very thin, well-distributed and more or less continuous layer,

rather than into a number of scattered spots. The fungicide will therefore prove more efficient with a "spreader" than without, as, where the spray dries up in spots, very little, if any, protection is afforded to the tissues in between. Where spreaders are used there is also very much less danger of damaging the leaves or fruit, for the reason that the concentration of the solid materials from the spray is never so intense at any one point as if no spreader is used. Moreover less spray is used as there is not such a tendency to hold the spray nozzles for some time in the one place to try and *force* the material to wet the tissues and stay on.



Fig. 2.—Spray boom of excellent type, showing the arrangement of nozzles to ensure thorough covering of such crops as potatoes, tomatoes, beans or similar plants grown in rows.

(After Mason, "*Spraying, Dusting and Fumigating of Plants.*")

CALCIUM CASEINATE SPREADER.

The following substances are some of those which have been used from time to time as spreaders or stickers in various sprays: oils, resins, soaps, glue, milk and molasses, but *calcium caseinate*, a by-product obtained from skim milk, is the only one which has become very popular or widely used. It should be used at the rate of one half to one pound ($\frac{1}{2}$ —1lb.) per 50 gallons of spray. In mixing, make the required amount of calcium caseinate into a paste in a billycan, jug, or other suitable receptacle, by putting the caseinate into the dry container and then adding as much water by volume as there is caseinate. Stir, so as to form a thin paste (just in the same way as powdered skim milk is mixed by the experienced housewife for human use) and, when made into a paste, dilute with water and add to the mixture in the spray tank, keeping the agitator going during the process.

SPREADERS FOR BORDEAUX MIXTURE OTHER THAN CALCIUM CASEINATE.

If calcium caseinate is not obtainable, one or other of the following substances may be used instead:—

1. A good brand of *commercial powdered skim milk*, used at the rate of $\frac{1}{2}$ —1lb. for every 50 gallons as indicated above for calcium caseinate.

2. *Sweet skim milk*, used at the rate of half a gallon to every 50 gallons of spray.

3. *Flour*, used at the rate of $\frac{1}{2}$ —1lb. to every 50 gallons of spray. Mix with water to a thin paste and then add to the mixture in the spray tank.

4. *Glue*, $\frac{1}{2}$ oz. to every 50 gallons of spray. Dissolve in hot water and then add to the mixture in the spray tank.

5. *Good quality soft soap*, 2—3lbs. per 50 gallons of spray. Dissolve in water and add to the spray mixture in the spray tank, or barrel, *only just before the spray is to be used*.

6. "*Resin-Fish Oil*" Soap, 2—3lbs. per 50 gallons of spray. Dissolve in water and add to the spray mixture in the spray tank, or barrel, *only just before the spray is to be used*.

"Resin-Fish Oil" Soap is especially valuable as a sticker and spreader in Bordeaux Mixture for spraying smooth-leaved plants such as cabbages, onions, carnations, etc.

In using any spray spreader it is advisable not to make the spray liquid in the spray tank, or barrel, up to the full volume until *after* the spreader has been added, so that the strength of the fungicide will always be as much as possible the same whenever it is made up to the same formula. In other words, if making up a 3—4—50 Bordeaux, the *final* volume of spray after the spreader has been added, should be just 50 gallons. A mental attitude of exactness should be maintained all through the operations of preparing the Bordeaux Mixture. Carelessness or "slipshod" methods in weighing out or preparing the materials, or in any other part of the operations, cannot be too strongly deplored.

FINAL NOTE.

Finally it should be pointed out that before using the spray apparatus, especially after it has been idle for any length of time, it should be thoroughly washed out to remove any chemicals which may have been left from the previous spraying. This is exceedingly important when the spray being used is a different kind from that previously employed, as, according to Cunningham (2), this mixing of different spray materials in the tank is one of the most frequent causes of spraying injury to plant tissues.

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(2) Cunningham, G. H.—"Fungous Diseases of Fruit Trees in New Zealand." The Brett Printing Co., Auckland, 1925.

(3) Mason, A. F.—"Spraying, Dusting and Fumigating of Plants." Macmillan Co., New York, 1929.

(4) New South Wales Department of Agriculture— "Spray Leaflet, No. 1, Bordeaux Mixture." Sydney, 1930.

HORTICULTURAL NOTES.

GEO. W. WICKENS,

Superintendent of Horticulture.

When I arrived back from a tour through the fruit-growing districts recently, one of the first things that I opened in my correspondence was a note from the Editor of the "Journal" reminding me that a contribution for the December number was due, and that, as the issue would be in print at Christmas time, he suggested that an element of brightness in any articles submitted would be in keeping with the festive season. To-night when setting out to write these notes I am viewing the "bright" suggestion with rather mixed feelings. In the first place, the man on the land, and I speak as one who spent youth and early manhood coaxing, not always successfully, Mother Earth to yield to me of her riches, is not expected either at Christmas or any other period of the year to be noted for his brightness. Philosophy, and a hope that springs eternal for a time when the results of his labour will be something more nearly commensurate with the effort put forth, and a faith that the hoped for result is a thing of the near, not distant, future—these are the attributes of the tiller of the soil, and I have known them continue in many instances when hope deferred might reasonably have made the stoutest heart sick. Some of our orchardists within the last few weeks saw all chance of a return for twelve months' work vanish in a few days, and though they are meeting the knock with a philosophic grin, I doubt if there is much of either mirth or brightness behind it.

I am referring to the apple growers in those areas which suffered from thrips invasion, and where the light crop of last season was confidently expected to be followed by a heavy one this season. Now a second lean year must be battled through. Not all our apple growers, nor all apple growing districts have suffered, for although the pest was present in all districts and its mark "like the trail of the serpent" can be distinguished throughout, in some places the damage done is negligible; in others it is devastation. The big fruit area within 40 miles of Albany, including Mount Barker, suffered very severely, while in the South-West, from the Preston to Bridgetown and Manjimup, the crop is very good and there are some orchards carrying bigger quantities than in any previous season. The lighter rainfall districts are the worst affected, and quite a few miles eastward makes a considerable difference; for instance, Bridgetown crops on the whole are heavy, 18 miles eastward at Boyup Brook they are patchy, some good, some light, some nearly a failure; ten miles further east at Dinninup they are uniformly very light. In the Hills near Perth some damage has been done to "Yates," "Cleopatras," and "Dunn's," but there are no failures, and "Jonathans," "Granny Smith," and "Dougherty" are heavy.

I expected in this issue of the "Journal" to make my customary estimate of the apple and pear crops, but am desirous now of visiting the thrips affected area again before doing so. I anticipated prior to the arrival of the pest that the apple crop would approximate 2,250,000 bushels, and I am not clear yet how much to deduct for the losses caused by the insects, but I believe with the heavy crop in the South-West it may reach 900,000 bushels, or even more, but I will not make a definite estimate until I see Mount Barker again. One very "bright" feature is the number of sales f.o.r. at satisfactory prices which are being made where the crops are heavy. With the depressed condition in the world's markets for other primary products it is very cheering to find that apples are holding a good position.

The pear crop is light, particularly the two main export varieties "Winter Nelis" and "Josephine." "Bartlett's" are patchy, some places heavy, some medium, some light. As a whole the crop will be distinctly less than last season.

The stone fruit crop is much less than last year, particularly late varieties of apricots, peaches and English plums.

The grape crop—wine, drying, and table varieties—is good to heavy, and there is a comparative freedom at the present time from Black Spot, Anthracnose.

It is too early yet to judge what the citrus crop will be, but considering that last season there was a heavy one, the present indications are quite fair.

Stone fruit growers will be interested and disturbed to know that the market inspectors have already (2-12-30) condemned a number of cases of apricots on account of infection by fruit fly. There is no doubt the pest carried through the mild winter of this year easily in oranges, and the low prices and glut periods when navels were being marketed probably accounted for the failure to pick up windfalls as carefully as this might and should have been attended to. The light crop of late stone fruits will afford an opportunity to bring the pest under control, which it behoves all those interested to take full advantage of.

This completes the notes, and on reading them through I must confess I can see very little evidence of the brightness desired by the Editor, certainly not "bright"; perhaps not altogether "dark"; shall we say "drab"?

At any rate before relinquishing my pen I will wish the orchardists and vigorous of Western Australia—those on whom fortune has frowned equally with those on whom the fickle jade has smiled—a cheery Christmas and a New Year free from depression.

PEDIGREE SEED WHEAT AND OATS.

I. THOMAS,

Superintendent of Wheat Farms.

It has long been recognised amongst stock breeders how potent, for increasing the quality of their flocks and herds, is the use of stud animals selected specially for their productivity. Similarly, the value of the pedigree seeds of selected strains of plants chosen also for their high productivity and disease resistance, is now realised by up-to-date farmers.

One of the principal functions of the State Experiment Farms has been the production of selected pedigree seed of standard varieties of wheat and oats. In view of the special work and facilities required for the production and maintenance of the purity of this seed its cost is relatively high.

With a view to assisting the farmers in this present time of stress, and recognising that, owing to the abnormally low price of wheat ruling, some farmers may not be in a position to purchase selected pedigree seed, and will thus be prevented from taking advantage of the benefits to be derived from its use if the usual prices obtain, the Minister for Agriculture (Hon. P. D. Ferguson) has decided to make drastic reductions in them. This policy has been further influenced by an appreciation of the fact that the use of this seed is an important factor in promoting a greater yield per acre, and thereby reducing the costs of production.

With the exception of the new varieties "Bencubbin" and "Sutton" the prices will be as under

<i>Wheat</i> —For 10 bag lots and over		12/-	per bag of 3 bus.
Lots under 10 bags		14/-	per bag of 3 bus.
<i>Oats</i> —For 10 bag lots and over		8/-	per bag of 3 bus.
Lots under 10 bags		10/-	per bag of 3 bus.

These will include rail freight to the siding nearest to the farmer's holding in the Wheat Belts.

The Department will have seed of the following varieties available—

<i>Wheat</i> —Baroota Wonder Early.	Nabawa.
Carrabin.	Noongaar.
Geeralying.	S.H.J.
Gluyas Early.	Yandilla King.
Merredin.	
<i>Oats</i> —Algerian.	Guyra.
Burt's Early.	Mulga.

In addition to the above varieties it is also anticipated that there will be a small quantity of the new varieties of wheat "Bencubbin" and "Sutton" available, but the applications already received for these varieties are in excess of the quantity which it is expected will be available for distribution. The price of these varieties will be £1 per bag, freight paid, as in the case of the other varieties. As the quantity of seed of "Bencubbin" and "Sutton" wheat will be limited, and, owing to the large number of applications already to hand, it has been found necessary to limit the amount to be supplied to any one applicant to one bag.

Any farmers desirous of obtaining pedigree seed wheat and oats of the above varieties should forward their application direct to the Department of Agriculture at an early date.

MEXICAN POPPY.

(*Argemone mexicana*, Linn.)

C. A. GARDNER, Government Botanist.

Mexican Poppy, as its name implies, is native to Mexico, its range extending northwards to Texas, and southwards to Central America. The plant is also known as Prickly Poppy. The genus, named after some classic plant the identity of which is now lost, contains ten species, all of which are American and some of them valued as garden plants with large white or yellow flowers.

This weed belongs to the Poppy family, and is therefore related to the plant which is the source of opium. Its yellow juice contains an alkaloid which gives reactions similar to morphia—a substance obtained from opium. The plant is poisonous, but apparently never eaten by stock since it is distasteful to horses, cattle and sheep, and in addition so prickly that it is naturally avoided. When cut with hay, the chaff fed to horses produces violent fits of gripes, according to New South Wales reports.



Icon origin

THE MEXICAN POPPY.

(Argemone mexicana, Linn.)

Mexican Poppy is a proclaimed noxious weed for the State of Western Australia. At the present time it is not very common, being reported from the following districts only :—Geraldton, Meekatharra, York and Toodyay. Notwithstanding this the plant is one which should be carefully eradicated whenever seen, since

it produces seeds freely, and is a very vigorous plant capable of flourishing under the most unfavourable conditions. In badly affected areas where the weed is dense, cultivation with a disc plough will be found effective. Smaller patches should be pulled by hand, or hoed out. Since the plant is an annual, it is essential for control that the plants should be prevented from seeding. This calls for the early recognition of the plant since it commences to flower at an early stage of growth, and continues to flower and seed until it dies. The seeds are produced in large numbers, and should these be formed and ripened on the plants, any efforts in the direction of eradication are wasted.

In the Mexican Poppy we have a plant which is a potential menace both to the pastoralist and the farmer. If it once becomes widespread it will undoubtedly be as serious as the Star Thistle. Early recognition of the plant when it first appears, and immediate destruction are the key to the problem in those districts in which the plant has not yet spread.

The Mexican Poppy can be distinguished readily by its prickly deeply lobed and white-blotched leaves, yellow poppy-like flowers and prickly 4-6-celled pod or capsule with numerous grey honey-comb-pitted seeds. The yellow juice which exudes freely when the stem is injured is another guide to identification.

OUTBREAK of DOWNY MILDEW ("Blue Mould") of TOBACCO.

The attention of farmers and growers is drawn to the following extracts from the *Government Gazette* of the 24th October last, with reference to tobacco seeds and plants:—

Distribution or Sale of Tobacco Seeds within Western Australia prohibited unless and until disinfected by, or under, the supervision of an Inspector under "The Plant Diseases Act, 1914."

"Plant Diseases Act, 1914."

ORDER IN COUNCIL.

WHEREAS it is enacted by Section 35 of "The Plant Diseases Act, 1914," that the Governor may make Regulations prescribing all matters which by this Act are required or permitted to be prescribed, or which it may be necessary or convenient to prescribe, for giving effect to this Act, and inter alia, prescribing the manner in which plants, fruits, and coverings in which plants and fruit have been contained or packed shall (whether infected or not) be treated in order to eradicate disease, or to lessen the risk of the spread of disease: And whereas certain Regulations were made under the said Act and published in the *Government Gazette* on the 16th day of September, 1921: And whereas Regulation 9 of such Regulations, prescribing fees payable for inspection and disinfection (if any) was amended by Order in Council published in the *Government Gazette* on the 1st day of April, 1926: And whereas it is now deemed expedient to amend the said Regulations by amending the said Regulation 9 as amended as aforesaid in the manner hereinafter mentioned, and by inserting a new Regulation as hereinafter mentioned: Now, therefore, His Excellency the Governor, acting with the advice and consent of the Executive Council, and in exercise of the power conferred by the said Act, doth hereby amend the Regulations made under the said Act and published in the *Government Gazette* on the 16th day of September, 1921, as follows:—

- (1) By inserting in Regulation 9 as amended by Order in Council published in the *Government Gazette* on the 1st day of April, 1926, after the last item contained in the scale of fees ending "1s. 6d.," an item as follows:—
 "For every ounce or part of an ounce of the seeds of the tobacco plant, 1s."

(2) By inserting after Regulation 48 a new Regulation as follows:—

“48A. No person shall sell, supply, distribute, deliver, or dispose of any seeds of the tobacco plant to any person, except an inspector appointed under ‘The Plant Diseases Act, 1914,’ unless and until such seeds have been inspected and disinfected by or under the supervision of an inspector appointed under the said Act and to his satisfaction.”

Importation of Tobacco Seeds and Tobacco Plants into Western Australia prohibited.

WHEREAS it is enacted by Section 5 of “The Plant Diseases Act, 1914,” that the Governor may by Proclamation prohibit, either absolutely or except in accordance with Regulations, the bringing into the State, either generally or from any specified State, country or place, any specified kind of plant, fruit, or other thing which would in his opinion be likely to introduce any disease into the State: And whereas, in the opinion of the Governor, tobacco plants and the seeds of the tobacco plant if brought into this State are likely to introduce disease into this State, and it is therefore deemed expedient to prohibit the bringing into the State generally from any other State, country, or place outside this State of tobacco plants and the seeds of the tobacco plant, except such tobacco plants and the seeds of the tobacco plant as may be required by the Department of Agriculture for its own purposes: Now, therefore I, the said Governor, acting with the advice and consent of the Executive Council, and in exercise of the power conferred by the said Act, do by this Proclamation prohibit the bringing into this State generally from any other State, country, or place outside this State of tobacco plants and the seeds of the tobacco plant, save and except such tobacco plants or the seeds of the tobacco plant as may be required by the Department of Agriculture for its own purposes.

LIVE STOCK AND MEAT.

For the information of readers of this “Journal,” the following particulars have been supplied by Messrs. Elder, Smith, and Coy., Ltd., Perth.

METROPOLITAN FAT STOCK MARKETS, SEPTEMBER, OCTOBER AND NOVEMBER, 1930.
COMPARATIVE YARDINGS OF STOCK SALES.

		September.				October.					November.			
		3rd.	10th.	17th.	24th.	1st.	7th.	15th.	22nd.	29th.	5th.	12th.	19th.	26th.
Sheep ...	...	12,911	15,188	13,757	18,053	16,317	12,186	18,575	21,842	17,413	15,218	16,943	16,551	14,210
Cattle ...	...	668	1,050	808	546	421	430	601	714	641	641	481	741	704
Pigs ...	...	986	865	990	744	1,303	540	1,201	865	1,069	1,046	792	979	992

COMPARATIVE VALUES PER POUND.

		September.				October.					November.			
		3rd.	10th.	17th.	24th.	1st.	7th.	15th.	22nd.	29th.	5th.	12th.	19th.	26th.
		d.	d.	Shn. 3d. d.	Shn. 3d. d.	Shn. 2½d. d.	Shn. 2½d. d.	Shn. 2½d. d.	d.	d.	d.	d.	d.	d.
Mutton ...	...	5½	5½	5	4½	3½	4	4	4	2½	2½	3	3	3
Beef ...	...	5½	5½	5	5½	6	6½	6	5½	5	4½	5½	5½	4½
Pork ...	...	7½	8	8	8	8	8	7½	7½	7½	5½	5½	6	6½
Bacon ...	...	7½	7½	7½	7	7	7	6½	6½	5½	5½	5½	5½	5½

MARKET REPORT.

Messrs. H. J. Wigmore & Co., Ltd., of Wellington Street, Perth, have supplied us with the following information regarding chaff offered at auction in the Perth Railway Yards, for the period September to November (inclusive). In all cases the price quoted is for f.a.q. to prime wheaten chaff, packed in new bags:—

		Maximum per ton.			Minimum per ton.				
	Quantity.	£	s.	d.	£	s.	d.		
September	.. 1,185 tons	..	4	12	6	..	3	15	0
October	.. 900 tons	..	4	2	6	..	3	15	0
November	.. 1,000 tons	..	4	5	0	..	3	7	6

The period under review has been very disappointing from a grower's standpoint, qualities under f.a.q. to prime have been very difficult to quit at low prices. At the time of going to press the market value for f.a.q. to prime is from £3 7s. 6d. to £3 10s.; f.a.q., from £2 17s. 6d. to £3 2s. 6d. per ton; mediums are in very poor request to as low as from £2 10s. to £2 15s.; damaged and inferior, suitable for cow chaff only, is selling at from £2 7s. 6d. to £2 10s. per ton.

Oaten Chaff.—During the past three months heavy supplies were available, and low prices ruled. During September, f.a.q. was selling at £3 5s., and in the last week of this month this quality realised up to £4 5s. per ton. In October heavy supplies came forward, and the market was over-supplied; f.a.q. was sold at from £2 17s. 6d. to £3 per ton. During November the market firmed a little, and f.a.q. sold at from £3 10s. to £3 15s., but at the time of going to press values have eased somewhat; f.a.q. is now selling at from £3 5s. to £3 7s. 6d. per ton.

Oats.—The market has been over-supplied, and with a lesser demand auctioneers have been forced to quit consignments at very low rates, the undermentioned being the closing quotations:—

September—Good heavy feed Guyras, 1s. 7d. to 1s. 8d. per bushel; good feed, 1s. 5d. to 1s. 6d. per bushel; light feed, 1s. 3d. to 1s. 4d. per bushel.

October and November—Good heavy feed Guyras, 1s. 5d. to 1s. 6d. per bushel; good feed, 1s. 3d. to 1s. 4d. per bushel; light feed, 10d. to 1s. 1d. per bushel.

Wheat.—During September f.a.q. was selling at from 3s. 5d. to 3s. 6d. per bushel; second grade, from 2s. 11d. to 3s. 1d. In October f.a.q. was selling at from 3s. 1½d. to 3s. 3d., second grade at from 2s. 6d. to 2s. 9d. per bushel. During the early part of November f.a.q. sold at from 2s. 9d. to 2s. 11d., with an occasional truck at 3s. per bushel; but at the time of writing, however, the market has eased further: f.a.q. is now selling at from 2s. 5d. to 2s. 6d.; second grade at from 2s. 3d. to 2s. 4d.; smutty and inferior at from 1s. 9d. to 2s. per bushel.

METEOROLOGICAL INFORMATION.

STATIONS.	TEMPERATURE.				RAINFALL.		TEMPERATURE.				RAINFALL.		
	Maximum.			Minimum.	For Month.	Aver. age.	Maximum.			Minimum.	For Month.	Aver. age.	
	Mean.	Highest.	Mean.				Mean.	Highest.	Mean.				Lowest.
SEPTEMBER, 1930.													
Chapman State Farm	72.6	91.7	49.5	40.3	inches.	1.21	1.64	75.9	86.4	49.8	41.5	0.84	0.96
Geraldton	72.4	94.5	54.6	42.6	inches.	0.98	1.37	73.5	86.8	54.3	46.8	0.88	0.71
Woolbeing	68.0	83.3	46.1	38.0	inches.	2.25	1.66	73.5	86.7	46.1	40.0	1.33	1.05
Perth	67.5	82.4	51.7	44.0	inches.	4.30	3.44	70.6	81.6	52.3	46.2	1.97	2.19
Kalamunda	65.0	81.2	49.6	40.5	inches.	5.72	4.64	69.9	81.2	49.4	41.2	2.15	3.20
Bunbury	64.8	80.0	49.3	39.0	inches.	2.86	3.91	67.3	75.0	49.6	39.0	2.57	2.43
Bridgeclown	65.0	81.0	43.3	33.0	inches.	4.60	3.74	71.0	86.0	42.6	36.0	2.37	3.04
Albany	63.6	79.0	47.9	39.0	inches.	4.36	4.13	68.8	88.0	49.9	41.0	1.17	3.25
Merredin State Farm	69.1	88.1	44.1	33.5	inches.	0.65	0.94	75.7	86.9	40.6	35.0	0.34	0.77
Northam	70.1	89.8	47.7	39.0	inches.	1.45	1.61	74.9	86.0	47.8	40.0	0.99	0.83
York	68.5	87.0	45.6	36.2	inches.	1.25	1.61	75.0	88.0	45.6	38.0	0.18	1.04
Narrogin State Farm	64.5	80.1	43.4	32.8	inches.	2.05	2.31	71.0	83.4	42.9	33.0	0.63	1.45
Katanning	64.3	82.2	45.8	37.7	inches.	1.52	1.95	70.9	85.3	46.0	37.6	0.56	1.59
Cape Leeuwin	61.8	72.0	52.9	44.8	inches.	3.27	3.43	65.0	76.2	53.5	48.0	3.05	2.90
OCTOBER, 1930.													
Chapman State Farm	75.9	86.4	49.8	41.5	inches.	0.84	0.96	86.3	99.4	55.3	40.9	0.14	0.20
Geraldton	72.4	94.5	54.6	42.6	inches.	0.98	1.37	77.1	100.4	59.6	49.4	0.08	0.46
Woolbeing	68.0	83.3	46.1	38.0	inches.	2.25	1.66	76.6	96.8	57.6	47.4	0.97	0.80
Perth	67.5	82.4	51.7	44.0	inches.	4.30	3.44	77.0	95.1	54.2	46.1	1.34	1.06
Kalamunda	65.0	81.2	49.6	40.5	inches.	5.72	4.64	72.2	90.2	54.3	41.0	0.83	1.02
Bunbury	64.8	80.0	49.3	39.0	inches.	2.86	3.91	78.4	101.0	48.8	35.2	1.43	1.15
Bridgeclown	65.0	81.0	43.3	33.0	inches.	4.60	3.74	82.0	97.8	53.7	42.0	2.00	1.43
Albany	63.6	79.0	47.9	39.0	inches.	4.36	4.13	84.4	97.8	53.5	43.0	0.01	0.46
Merredin State Farm	69.1	88.1	44.1	33.5	inches.	0.65	0.94	82.0	99.0	54.9	42.0	0.03	0.40
Northam	70.1	89.8	47.7	39.0	inches.	1.45	1.61	82.7	100.5	52.6	40.0	0.08	0.43
York	68.5	87.0	45.6	36.2	inches.	1.25	1.61	79.3	96.5	48.4	35.8	0.25	0.60
Narrogin State Farm	64.5	80.1	43.4	32.8	inches.	2.05	2.31	78.1	97.0	45.9	40.6	0.31	0.69
Katanning	64.3	82.2	45.8	37.7	inches.	1.52	1.95	78.1	97.0	45.9	40.6	0.31	0.69
Cape Leeuwin	61.8	72.0	52.9	44.8	inches.	3.27	3.43	67.2	78.2	56.0	49.8	1.07	1.26
NOVEMBER, 1930.													

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 No. 24.—*Hints to Stock Breeders* (revised). R. E. Weir.
 No. 30.—*Descriptive Account of the Codlin Moth*. L. J. Newman.
 No. 37.—*Conference of Producers, 1910 and 1912*.
 No. 46.—*Fruit Packing and Marketing and Exporting of Fruit*. J. F. Moody and J. Ramage.
 Price 1s. 6d.
 No. 49.—*The Feeding of Horses*. Professor Paterson and G. L. Sutton.
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 No. 60.—*The Farmer's Clip*. J. J. Mahood.
 No. 68.—*Flaying and Treatment of Hides*. R. E. Weir.
 No. 72.—*The Potato : Its Cultivation, Pests and Diseases*. G. N. Lowe, L. J. Newman,
 D. A. Herbert.
 No. 79.—*Sheep on the Wheat Farm and their Management in W.A.* H. McCallum.
 No. 83.—*Horticulture and Viticulture*. A. Despeissis. Price 2s.
 No. 87.—*Sheep Feeding Experiments : State Farm, Chapman, 1920*. G. L. Sutton and
 F. Vanzetti.
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 No. 99.—*Australian White*. G. L. Sutton.
 No. 101.—*Cotton Cultivation*. G. L. Sutton.
 No. 103.—*Kerosene Method for Eradicating Zamia Palm*. G. K. Baron-Hay.
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 No. 109.—*Rape*. G. L. Sutton.
 No. 111.—*Standard Wheat Varieties*. G. L. Sutton and F. Vanzetti.
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 No. 243.—*Successful Codlin Moth Control in W.A.* G. W. Wickens. (Reprint from "Journal.")
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- No. 279.—*Curculio Beetle*. A. Flintoff. (Reprint from "Journal.")
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- No. 284.—*The Common Blue Lupin*. C. A. Gardner and H. G. Elliott. (Reprint from "Journal.")
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- No. 292.—*Cultivation of Onions*. E. T. Morgan, Vegetable Inspector.

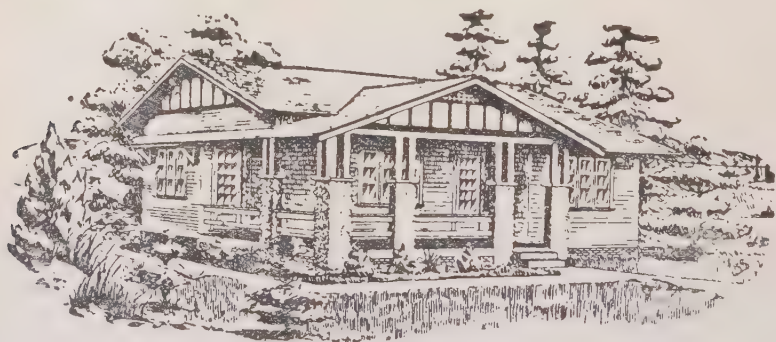
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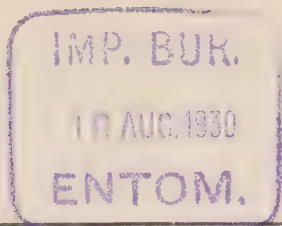
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EXD.



Supplement to "Journal of Agriculture," June, 1930.

ENUMERATIO PLANTARUM AUSTRALIAE OCCIDENTALIS

Auctore

CHARLES A. GARDNER.

PART II.

(Proteaceae - Papilionaceae)

Published June 1930.

B. verticillata, R.Br. in l. c. 207.

B. dryandroides, Baxter in Sweet Hort. Brit. 350 (1827).

B. Brownii, Baxter ex R.Br. Prodr. Suppl. 37 (1830).

Cyrtostylis.

B. attenuata, R.Br. in Trans. Linn. Soc. x, 209 (1810).

B. Elderiana, F.v.M. et Tate, Bot. Centralbl. lv. 317 (1893).

B. media, R.Br. Prodr. Suppl. 35 (1830).

B. audax, Gardner, in Journ. Roy. Soc. W. Austr. xiii. 63 (1927).

B. Solandri, R.Br. Prodr. Suppl. 36 (1830).

B. Goodii, R.Br. l. c. 36.

B. petiolaris, F.v.M. Fragm. iv. 109 (1864).

B. repens, Labill. Voy. i. 412. t. 23 (1798).

B. prostrata, R.Br. Prodr. Suppl. 36 (1830).

B. grandis, Willd. Sp. Pl. i. 535 (1797).

B. quercifolia, R.Br. in Trans. Linn. Soc. x. 210 (1810).

B. Baueri, R.Br. Prodr. Suppl. 35 (1830).

Eubanksia.

B. dentata, Linn. fil. Suppl. 127 (1781).

Orthostylis.

B. coccinea, R.Br. in Trans. Linn. Soc. x. 207 (1810).

B. spectrum, Meissn. in Hook. Kew Journ. vii. 120 (1855).

B. Menziesii, R.Br. Prodr. Suppl. 36 (1830).

B. laevigata, Meissn. in Hook. Kew Journ. iv. 210 (1852).

B. Hookeriana, Meissn. in l. c. vii. 119 (1855).

B. prionotes, Lindl. Swan Riv. App. 34 (1839).

B. Victoriae, Meissn. in Hook. Kew Journ. vii. 119 (1855).

B. speciosa, R.Br. in Trans. Linn. Soc. x. 210 (1810).

B. Baxteri, R.Br. Prodr. Suppl. 36 (1830).

B. prae-morsa, Andrews, in Bot. Rep. t. 258 (1802). (*B. marcescens*, R.Br.)

B. Lemanniana, Meissn. in Hook. Kew Journ. iv. 210 (1852).

B. Caleyi, R.Br. Prodr. Suppl. 35 (1830).

B. Lindleyana, Meissn. in Hook. Kew Journ. vii. 120 (1855).

B. elegans, Meissn. in l. c. 119.

B. Candolleana, Meissn. in l. c. 118.

Isostylis.

B. ilicifolia, R.Br. in Trans. Linn. Soc. x. 211 (1810).

15. *DEYANDRA*, R.Br. in Trans. Linn. Soc. x. 211. t. 3 (1810).

D. quercifolia, Meissn. in Hook. Kew Journ. iv. 210 (1852).

D. prae-morsa, Meissn. in Lehm. Pl. Preiss. ii. 265 (1847).

D. cuneata, R.Br. in Trans. Linn. Soc. x. 212 (1810).

D. falcata, R.Br. in l. c. 213. (*D. Dorrienii*, Domin.)

D. armata, R.Br. in l. c. 213.

D. longifolia, R.Br. l. c. 215.

D. Fraseri, R.Br. Prodr. Suppl. 39 (1830).

D. floribunda, R.Br. in Trans. Linn. Soc. x. 212 (1810).

D. carduacea, Lindl. Swan Riv. App. 33 (1839).

D. carlinoides, Meissn. in Lehm. Pl. Preiss. ii. 267 (1847).

D. polycephala, Benth. Fl. Austr. v. 570 (1870).

D. Kippistiana, Meissn. in Hook. Kew Journ. vii. 122 (1855).

D. squarrosa, R.Br. Prodr. Suppl. 38 (1830).

D. serra, R.Br. l. c. 38.

D. concinna, R.Br. l. c. 38.

D. foliolata, R.Br. l. c. 38.

D. stuppea, Lindl. Swan Riv. App. 33 (1839).

D. nobilis, Lindl. l. c. 33.

D. mucronulata, R.Br. in Trans. Linn. Soc. x. 213 (1810).

D. formosa, R.Br. l. c. 213 t. 3.

D. Baxteri, R.Br. Prodr. Suppl. 38 (1830).

D. nivea, R.Br. in Trans. Linn. Soc. x. 214 (1810).

D. arctotidis, R.Br. Prodr. Suppl. 39 (1830).

D. nana, Meissn. in Hook. Kew Journ. vii. 121 (1855).

D. Preissii, Meissn. in Lehm. Pl. Preiss. i. 599 (1845).

D. sclerophylla, Meissn. in Hook. Kew Journ. vii. 123 (1855).

D. pulchella, Meissn. in l. c. iv. 211 (1852).

- D. plumosa*, R.Br. in Trans. Linn. Soc. x. 214 (1810).
D. seneciifolia, R.Br. Prodr. Suppl. 39 (1830).
D. erythrocephala, Gardner, in Journ. Roy. Soc. W. Austr. xiii. 63 (1927).
D. vestita, (Kippist) Meissn. in Hook. Kew Journ. vii. 121 (1855).
D. cirsiioides, Meissn. in l. c. iv. 211 (1852).
D. Purdieana, Diels, in Engler's Botan. Jahrb. xxxv. 174 (1904).
D. Gilbertii, S. Moore, in Journ. Linn. Soc. xlv. 211 (1920).
D. Hewardiana, Meissn. in Hook. Kew Journ. iv. 210 (1852).
D. patens, Benth. Fl. Austr. v. 578 (1870).
D. conferta, Benth. l. c. 578.
D. horrida, Meissn. in Hook. Kew Journ. iv. 211 (1852).
D. serratuloides, Meissn. in l. c. vii. 123 (1855).
D. comosa, Meissn. in l. c. iv. 211 (1852).
D. Shuttleworthiana, Meissn. l. c. vii. 122 (1855).
D. speciosa, Meissn. in l. c. iv. 211 (1852).
D. tridentata, Meissn. in l. c. vii. 120 (1855).
D. tenuifolia, R.Br. in Trans. Linn. Soc. x. 215 (1810).
D. proteoides, Lindl. Swan Riv. App. 33 (1839).
D. runcinata, Meissn. in Hook. Kew Journ. iv. 210 (1852).
D. obtusa, R.Br. in Trans. Linn. Soc. x. 214 (1810).
D. bipinnatifida, R.Br. Prodr. Suppl. 39 (1830).
D. pteridifolia, R.Br. in Trans. Linn. Soc. x. 215 (1810).
D. calophylla, R.Br. Prodr. Suppl. 40 (1830).

SANTALALES.

Santalaceae.

- 1. *ANTHOBOLOUS***, R.Br. Prodr. Fl. Nov. Holl. 357 (1810).
A. foveolatus, F.v.M. Fragm. i. 212 (1859).
A. exocarpoides, F.v.M. Fragm. ix. 3 (1875).
- 2. *EXOCARPUS***, Labill. Voy. i. 155 t. 14 (1798).
E. latifolia, R.Br. Prodr. 356 (1810).
E. odorata (Miq.) D.C. in D.C. Prodr. xiv. 689 (1857).
E. cupressiformis, Labill. Voy. i. 155. t. 14 (1798).
E. spartea, R.Br. Prodr. 356 (1810).
E. aphylla, R.Br. Prodr. 357 (1810).
- 3. *CHORETRUM***, R.Br. Prodr. Fl. Nov. Holl. 354 (1810).
C. glomeratum, R.Br. Prodr. 354 (1810).
C. pendulum, Tovey et Morris, in Proc. Roy. Soc. Vict. n.s. xxxiv. 209 (1922).
C. Pritzeli, Diels, in Engler's Botan. Jahrb. xxxv. 177 (1904).
C. lateriflorum, R.Br. Prodr. 354 (1810).
- 4. *LEPTOMERIA***, R.Br. Prodr. Fl. Nov. Holl. 353 (1810).
L. spinosa, (Lehm.) D.C. in D.C. Prodr. xiv. 678 (1857).
L. pachyelada, Diels, in Engler's Botan. Jahrb. xxxv. 178 (1904).
L. Preissiana, (Miq.) D.C. in D.C. Prodr. xiv. 678 (1857).
L. pauciflora, R.Br. Prodr. 354 (1810).
L. scrobiculata, R.Br. Prodr. 354 (1810).
L. squarrosa, R.Br. l. c. 354.
L. Rohlenae, Domin, Zolastni Olisk 2 Vestnika Kral. Spol. t. ii. 21 (1923).
L. Cunninghamii, Miq. in Lehm. Pl. Preiss. i. 611 (1845).
L. empetriformis, Miq. l. c. 610.
L. axillaris, R.Br. Prodr. 354 (1810).
L. laxa, Miq. in Lehm. Pl. Preiss. i. 612 (1845).
L. obovata, Miq. l. c. 613.
- 5. *SANTALUM***, Linn, Gen. ed. II. 165 (1742). (*Fusanus*, R.Br. p.p.;
Eucarya, (Mitch.) Sprague et Summerhayes, p.p.)
S. lanceolatum, R.Br. Prodr. 356 (1810).
S. Murrayanum, (L. T. Mitch.) Gardn. comb. nov. (*F. persicarius*, F.v.M.)
S. acuminatum, (R.Br.) D.C. Prodr. xiv. 684 (1856). (*F. acuminatus*, R.Br.)
S. spicatum, (R.Br.) D.C. l. c. 685. (*F. spicatus*, R.Br.)

Opiliaceae.

1. *OPILIA*, Roxb. Pl. Corom. ii. 31. t. 158 (1799).
O. amentacea, Roxb. Pl. Corom. ii. 31. t. 158 (1799).

Olacaceae.

1. *OLAX*, Linn. Diss. Dass. 3 (1747).
O. phyllanthi, (Labill.) R.Br. Prodr. 358 (1810).
O. Benthamiana, Miq. in Lehm. Pl. Preiss. i. 228 (1844).

Loranthaceae.

1. *NUYTSIA*, R.Br. in Journ. Geogr. Soc. i. 17 (1831).
N. floribunda, (Labill.) R.Br. in Journ. Geogr. Soc. i. 17 (1831).
2. *AMYEMA*, Van Tiegh, Bull. Soc. Bot. Fr., xli. 483, 488 (1894). (*Loranthus* p.p.)
A. gibberula, (Tate) Danser, Bull. Jard. Bot. Buit. x. 295 (1929).
 L. gibberulus, Tate.
A. bifurcata, (Benth.) V. Tiegh. Bull. Soc. Bot. Fr. xli. 507 (1894).
 (*L. bifurcatus*, Benth.)
A. ferruginiflora, (W. V. Fitzg.) Dans. Bull. Jard. Bot. Buit. x. 295 (1929).
 (*L. ferruginiflorus*, W. V. Fitzg.)
A. sanguinea, (F.v.M.) Danser, l. c. 298. (*L. sanguineus*, F.v.M.)
A. Miquelii, (Lehm.) V. Tiegh. Bull. Soc. Bot. Fr. xli. 507 (1894). (*L. Miquelii*, Lehm.)
A. Cynei-Sinus, (Blakely) Dans. Bull. Jard. Bot. Buit. x. 295 (1929).
 (*L. Cynei-Sinus*, Blakely.)
A. miraculosa, (Miq.) Van Tiegh. Bull. Soc. Bot. Fr. xli. 94 (1894).
 (*L. miraculosus*, Miquel.)
A. Preissii, (Miq.) van Tiegh l. c. 84. (*L. Preissii*, Miq.)
A. linophylla (Fenzl.) Van Tiegh l. c. 65. (*L. linophyllus*, Fenzl.)
A. Nestor, (S. Moore) Danser, Bull. Jard. Bot. Buit. x. 297 (1929). (*L. Nestor*, S. Moore.)
A. Quandang, (Lindl.) Van Tiegh, Bull. Soc. Bot. Fr. xli. 507 (1894).
 (*L. Quandang*, Lindl.)
A. Benthami, (Blakely) Danser, Bull. Jard. Bot. Buit. x. 294 (1929).
 (*L. Benthami*, Blakely.)
A. Fitzgeraldii, (Blakely) Dans. l. c. 295. (*L. Fitzgeraldii*, Blakely.)
A. acacioides, (A. Cunn.) Danser, l. c. 293. (*L. acacioides*, (A. Cunn.) Benth.)
3. *LYSIANA*, Van Tiegh. Bull. Soc. Bot. France, xli. 599 (1894). (*Loranthus*, Linn. p.p.)
L. Murrayi, (Tate) Van Tiegh, Bull. Soc. Bot. Fr. xli. 603 (1894). (*L. Murrayi*, F.M. et Tate.)
L. linearifolia, (Hook.) Van Tiegh. l. c. 603. (*L. Mitchellianus*, Blakely.)
L. Casuarinae, (Miq.) Van Tiegh. l. c. 601. (*L. Casuarinae*, Miq.)
L. Exocarpi, (Behr.) Van Tiegh. l. c. 603. (*L. Exocarpi*, Behr.)
4. *AMYLOTHECA*, Van Tiegh., Bull. Soc. Bot. France xli. 261 (1894). (*Loranthus*, p.p.)
A. triflora, (Span.) Danser, Bull. Jard. Bot. Buit. x. 302 (1929). (*L. signatus*, F.v.M.)
A. amplexans, (Van Tiegh) Dans. in. l. c. 300. (*L. amplexans*, Van Tiegh.)
A. biangulata, (W. V. Fitzg.) Danser. in l. c. 300. (*L. biangulatus*, W. V. Fitzg.)
5. *DIPLATIA*, Van Tiegh., Bull. Soc. Bot. France, xli. 501 (1894). (*Loranthus*, p.p.)
D. Maidenii, (Blakely) Danser in Bull. Jard. Bot. Buit. x. 312 (1929).
 (*L. Maidenii*, Blakely.)
D. grandibracteata, (F.v.M.) Van Tiegh., Bull. Soc. Bot. Fr. xli. 502 (1894).
 (*L. grandibracteatus*, F.v.M.)
6. *DENDROPHTHOE*, Mart., Flora, 1830, I. 109 (1830). (*Loranthus*, Linn. p.p.)
D. curvata, (Blume) Miq. Fl. Ind. Bat. l. 1. 820 (1855). (*L. vitellinus*, F.v.M.)

7. *KORTHALSELLA*, Van Tiegh., in Bull. Soc. Bot. Fr. xliii. 83 (1896).
(*Viscum*, Linn. p.p.)
K. articulata, (Benth.) Blakely in Proc. Linn. Soc. N.S. Wales, liii. 33
(1928). (*Viscum articulatum*, Benth.)

POLYGONALES.

Polygonaceae.

- **EMEX*, Necker, Elem. Bot. ii. 214 (1790).
**E. australis*, Steinh. (Afr. Austr.) "Double Gee."
1. *RUMEX*, Linn. Syst. ed. I. (1733).
**R. pulcher*, Linn. (Europ. Asia.) "Fiddle Dock."
R. Brownii, Campd. Monogr. Rum. 81 (1819).
**R. conglomeratus*, Murray. (Cosmop.) "Clustered Dock."
**R. crispus*, Linn. (Reg. temp.) "Curled Dock."
**R. Acetosella*, Linn. (Reg. temp.) "Sheep Sorrel."
2. *POLYGONUM*, (Tourn.) Linn. Syst. ed. I. (1735).
**P. aviculare*, Linn. (Cosmop.) "Wireweed," "Hogweed."
P. prostratum, R.Br. Prodr. 419 (1810).
P. serratulatum, Lag. Gen. et Sp. Nov. 14 (?).
P. attenuatum, R.Br. Prodr. 429 (1810).
3. *MUEHLENBECKIA*, Meissn, Gen. 316, Comm. 227 (1843).
M. adpressa, (Labill.) Meissn. Gen. Comm. 227 (1843).
M. polybotrya, Meissn. in Lehm. Pl. Preiss, i. 623 (1845).
M. Cunninghamii, (Meissn.) F.v.M. Fragm. v. 91 (1865).
M. dielina, (F.v.M.) Druce, in Rep. Bot. Exch. Cl. Brit. Is. 1916, 636 (1917).
(*M. polygonoides*, F.v.M.)

CENTROSPERMAE.

Chenopodiaceae.

1. *RHAGODIA*, R.Br. Prodr. Fl. Nov. Holl. 408 (1810).
R. baccata, (Labill.) Moq. in D.C. Prodr. xiii. ii. 50 (1849).
R. parabolica, R.Br. Prodr. 408 (1810).
R. dioica, Nees in Lehm. Pl. Preiss, i. 636 (1845).
R. Preissii, Moq. in. D.C. Prodr. xiii. ii. 49 (1849).
R. Gaudichaudiana, Moq. Chenop. Enum. 11 (1840).
R. spinescens, R.Br. Prodr. 408 (1810).
R. obovata, Moq. Chenop. Enum. 10 (1840).
R. crassifolia, R.Br. Prodr. 408 (1810).
R. coralliocarpa, S. Moore, in Journ. Bot. 168 (1897).
R. nutans, R.Br. Prodr. 408 (1810).
2. *CHENOPODIUM*, (Tourn.) Linn. Syst. ed. I. (1735).
C. nitariaceum, (F.v.M.) Benth. Fl. Austr. v. 158 (1870).
**C. ambrosioides*, Linn. (Cosmop.) "Ant weed."
C. rhadinostachyum, F.v.M. in Wing's South. Sci. Rec. ii. 98 (1880).
C. simulans, F.v.M. et Tate, in Proc. Roy. Soc. S.A. viii. 71 (1885).
C. carinatum, R.Br. Prodr. 407 (1810).
C. cristatum, F.v.M. Fragm. vii. 11 (1869).
C. auricomum, Lindl. in Mitch. Trop. Austr. 94 (1848).
**C. album*, Linn. (fere Cosmop.) "Mexican Spinach."
**C. murale*, Linn. (fere Cosmop.) "Nettle-leaved Goosefoot."
C. glaucum, Linn. Sp. Pl. 220 (1753).
5. *DYSIPHANIA*, R.Br. Prodr. Fl. Nov. Holl. 411 (1810).
D. plantaginella, F.v.M. Fragm. i. 61 (1858).
D. littoralis, R.Br. Prodr. 412 (1810). (*D. myriocephala*, Benth.)
4. *ATRIPLEX*, (Tourn.) Linn. Syst. ed. I. (1735).
A. stipitatum, Benth. Fl. Austr. v. 168 (1870).
A. Moquinianum, Webb, in D.C. Prodr. xiii. 97 (1849).

- A. Drummondii*, Moq. in D.C. Prodr. xiii. 102 (1849).
A. isatidium, Moq. Chemop. Enum. 63 (1840).
A. nummularium, Lindl. in Mitch. Trop. Austr. 64 (1848).
A. paludosum, R.Br. Prodr. 406 (1810).
A. angulatum, Benth. Fl. Austr. v. 174 (1870).
A. velutinellum, F.v.M. Rep. Babb. Exped. 20 (1858).
A. vesicarium, (Heward) Benth. Fl. Austr. v. 172 (1870).
A. hymenothecum, Moq. in D.C. Prodr. xiii. ii. 101 (1849).
A. cinereum, Poir. Encl. suppl. i. 471 (1810).
A. rhagodioides, F.v.M. in Trans. Phil. Inst. Vict. ii. 74 (1857).
A. quadrivalvatum, Diels, in Engler's Botan. Jahrb. xxxv. 182 (1904).
A. patulum, Linn. Sp. Pl. 1053 (1735).
A. semibaccatum, R.Br. Prodr. 406 (1810).
A. prostratum, R.Br. l. c. 406.
A. Muelleri, Benth. Fl. Austr. v. 175 (1870).
A. elachophyllum, F.v.M. Fragm. vii. 8 (1870).
A. halimoides, Lindl. in Mitch. Three Exped. i. 282 (1838).
A. spongiosum, F.v.M. in Trans. Phil. Inst. Vict. ii. 74 (1857).
5. *BASSIA*, Allioni, Mel de Phil. Soc. Roy. Turin, iii. 177. t. 4 (1766).
B. astrocarpa, F.v.M. Fragm. xii. 12 (1882).
B. Muelleri, (Benth.) F.v.M. l. c. 13.
B. eurotioides, F.v.M. Fragm. xii. 13.
B. densiflora, W. V. Fitzg. in Muell. Bot. Soc. Perth, 31 (1904).
B. sclerolaenoides, F.v.M. Fragm. xii. 12 (1882).
B. ericantha, (F.v.M.) R. H. Anderson in Proc. Linn. Soc. N.S.W. xlviii. 328 (1925).
B. uniflora, (R.Br.) F.v.M. First Census (1882).
B. recurviuspis, W. V. Fitzg. in Journ. Muell. Bot. Soc. Perth 32 (1904).
B. glabra, F.v.M. First Census (1882).
B. divaricata, (R.Br.) F.v.M. Fragm. xii. 13 (1882). (*B. hostilis*, Diels.)
B. lanicuspis, F.v.M. Fragm. xii. 13 (1882).
B. Drummondii, (Benth.) F.v.M. Cens. of Austr. pl. 30 (1882).
B. patentiuspis, R. H. Anderson, in Proc. Linn. Soc. N.S. Wales, xlviii. 338 (1923).
B. obliquiuspis, R. H. Anderson, in l. c. 337.
B. intricata, R. H. Anderson, in l. c. 340.
B. Forrestiana, F.v.M. Fragm. xii. 12 (1882).
B. bicornis, (Lindl.) F.v.M. l. c. 13.
B. Cornishiana, F.v.M. Aust. Chem. 1885.
B. microcarpa, R. H. Anderson, in Proc. Linn. Soc. N.S. Wales, xlviii, 348 (1923).
B. parviflora, R. H. Anderson, in l. c. 347.
B. convexula, R. H. Anderson, in l. c. 346.
B. costata, R. H. Anderson, in l. c. 347.
B. paradoxa, (R.Br.) F.v.M. Fragm. xii. 13 (1882).
B. tridens, F.v.M. Fragm. xii. 12 (1882).
6. *MALACOCERA*, R. H. Anderson, in Proc. Linn. Soc. New South Wales, li. 382 (1926).
M. tricornis, (Benth.) R. H. Anderson, in Proc. Linn. Soc. N.S.W. li. 382 (1926). (*Bassia tricornis*, F.v.M.)
7. *KOCHIA*, Roth, in Schrad. Journ. Bot. 1800, i. 307, t. 2 (1801).
K. lobiflora, (F.v.M.) Benth. Fl. Austr. v. 184 (1870).
K. lanosa, Lindl. in Mitch. Trop. Austr. 88 (1848).
K. prostecochaeta, F.v.M. Fragm. xii. 14 (1882).
K. Atkinsiana, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 31 (1904).
K. melanocoma, F.v.M. Fragm. xii. 14 (1882).
K. polypterygin, Diels, in Engler's Botan. Jahrb. xxxv. 183 (1904).
K. triptera, Benth. Fl. Austr. v. 185 (1870).
K. Ostenfeldi, Paulsen, in Dansk. Bot. Arkiv. ii. n. 8. 60 (1918).
K. oppositifolia, F.v.M. in Trans. Viet. Inst. i. 134 (1855).
K. amoena, Diels, in Engler's Botan. Jahrb. xxxv. 183 (1904).
K. brevifolia, R.Br. Prodr. 409 (1810).
K. pyramidata, Benth. Fl. Austr. v. 186 (1870).

- K. spongiocarpa*, F.v.M. in Viet. Natl. iii. 92 (1886).
K. Georgii, Diels, in Engler's Botan. Jahrb. xxxv. 184 (1904).
K. Stowardi, S. Moore, in Journ. Linn. Soc. Bot. xlv. 189 (1920).
K. aphylla, R.Br. Prodr. 409 (1810).
K. villosa, Lindl. in Mitch. Trop. Austr. 91 (1848).
K. Murrayana, Ewart et Rees, in Proc. Roy. Soc. Vict. (n. s.) xxiii. 16 (1909).
K. planifolia, F.v.M. Fragm. i. 213 (1859).
K. sedifolia, F.v.M. in Trans. Vict. Inst. i. 134 (1855).
K. glomerifolia, F.v.M. et Tate, in Trans. Roy. Soc. S.A. xvi. 345 (1896).
K. Massoni, A. J. Ewart in Proc. Roy. Soc. Vict. (n. s.) xx. 82 (1907).
K. carnosa, (Miq.) R. H. Anderson, in Proc. Linn. Soc. N.S. Wales, xlviii. 353 (1923).
8. *ENCHYLAENA*, R.Br. Prodr. Fl. Nov. Holl. 407 (1810).
E. micrantha, Benth. Fl. Austr. v. 181 (1870).
E. tomentosa, R.Br. Prodr. 408 (1810).
E. marginata, Benth. Fl. Austr. v. 182 (1870).
 9. *DIDYMANTHUS*, Endl. Nov. Stirp. Dec. 7 (1839).
D. Roei, Endl. Nov. Stirp. Dec. 8 (1839).
 10. *THRELKELDIA*, R.Br. Prodr. Fl. Nov. Holl. 409 (1810).
T. diffusa, R.Br. Prodr. 410 (1810).
T. drupata, Diels, in Engler's Botan. Jahrb. xxxv. 187 (1904).
T. haloragoides, (F.v.M.) Benth. Fl. Austr. v. 198 (1870).
 11. *ARTHROCNEUM*, (Moq.) Chenop. Enum. 111 (1841) partim.
A. arbusculum, (R.Br.) Moq. Chenop. Enum. 113 (1841).
A. Donaldsoni, Ewart et White, in Journ. Roy. Soc. N.S.W. xlii. 194 (1909).
A. leiostachyum, (Benth.) Paulsen, in Dansk. Bot. Arkiv. ii. n. 8. 61 (1918).
A. Benthami, Paulsen, in l. c. 62.
A. biden, Nees ab Essenchbach in Lehm. Pl. Preiss. i. 633 (1845).
A. halocnemoides, Nees l. c. 632.
A. pruinatum, Paulsen, in Dansk. Bot. Arkiv. ii. n. 8. 63 (1918).
A. brachystachyum, Paulsen, in l. c. 64.
A. Lylei, (Ewart) J. M. Black, in Trans. Roy. Soc. S. Austr. xliii. 359 (1919).
 12. *PACHYCORNIA*, Hook. fil. in Benth. et Hook. f. Gen. Plant. iii. 65 (1880).
P. triandra, (F.v.M.) Black, Fl. S. Austr. 206 (1924).
 13. *SALICORNIA*, Linn. Sp. Pl. ed. I. 357 (1737).
S. australis, Banks et Soland. in Forst. Fl. Insul. Austr. Prodr. 88 (1786).
 14. *SUAEDA*, Forsk. Fl. Ægypt. Arab. 69 t. 1813 (1775).
S. australis, (R.Br.) Moq. in Ann. Sc. Nat. ser. I. xxiii. 318 (1831).
(S. maritima, R.Br.)
 15. *SALSOLA*, Linn. Syst. ed. I. (1735).
S. Kali, Linn. Sp. Pl. 222 (1753).

Amarantaceae.

1. *HEMICHROA*, R.Br. Prodr. Fl. Nov. Holl. 409 (1810).
H. pentandra, R.Br. Prodr. 409 (1810).
H. diandra, R.Br. l. c. 409.
2. *AMARANTUS*, Linn. Syst. ed. I. (1735).
**A. retroflexus*, Linn. (Amer. bor.)
**A. patulus*, Bertoli. (Amer. bor.)
A. pallidiflorus, F.v.M. Fragm. i. 140 (1859).
A. viridis, Linn. Sp. Pl. ed. II. 1405 (1753).
3. *TRICHINIUM*, R.Br. Prodr. Fl. Nov. Holl. 414 (1810).
i. *Astrotricha*.
T. obovatum, Gaud. in Freyc. Voy. Bot. 445 (1826).
T. Elderi, Farman, in Bull. Herb. Boiss, ser. II. v. 1088 (1905).
T. incanum, R.Br. Prodr. 415 (1810).

- T. Roei, (F.v.M.) Benth. Fl. Austr. v. 240 (1870). (*T. Sewelliae*, F.v.M.)
T. astrolasium, (F.v.M.) Benth. l. c. 222.

ii. *Straminea*.

- T. distans, R.Br. Prodr. 415 (1810).
T. longistachyum, (W. V. Fitzg.) Gardn. comb. nov. (*Ptilotus longistachyus*, W.V.F.)
T. alopecuroides, Lindl. in Mitch. Three Exped. ii. 13 (1839).
T. polystachyum, Gaud. in Freye. Voy. Bot. 445 (1826).
T. macrocephalum, R.Br. Prodr. 415 (1810).
T. Clementi, Farmar, in Bull. Herb. Boiss. ser. II. v. 1087 (1905).
T. rotundifolium, F.v.M. Fragm. iii. 122 (1863).
T. corymbosum, Gaud. in Freye. Voy. Bot. 444 (1826).
T. eremita, S. Moore, in Journ. Linn. Soc. xxxiv. 218 (1898)

iii. *Rhodostachya*, Benth.

- T. parvifolium, F.v.M. Rep. Babb. Exped. 19 (1858).
T. Polakii, (F.v.M.) Diels et Pritzel in Engler's Botan. Jahrb. xxxv. 191 (1904).
T. exaltatum, (Nees) Benth. Fl. Austr. v. 227 (1870).
T. Manglesii, Lindl. Bot. Reg. t. 28 (1839).
T. gomphrenoides, Moq. in. D.C. Prodr. xiii. ii. 287 (1849).
T. esquamatum, Benth. Fl. Austr. v. 229 (1870).

iv. *Incurva*, Benth.

- T. declinatum, (Nees) Moq. in D.C. Prodr. xiii. ii. 293 (1849).

v. *Polyccephala*, Benth.

- T. divaricatum, Gaud. in Freye. Voy. Bot. 445 (1826).
T. helipteroides, F.v.M. Fragm. iii. 122 (1863).
T. Stirlingii, Lindl. Bot. Reg. t. 28 (1839).
T. laxum, Benth. Fl. Austr. v. 232 (1870).
T. depressum, (W. V. Fitzg.) Farmar, in Bull. Herb. Boiss. ser. II. v. 1088 (1905).
T. axillare, (F.v.M.) Benth. Fl. Austr. v. 232 (1870).
T. striatum, (Moq.) Benth. l. c. 233.
T. auriculifolium, (A. Cunn.) Moq. in D.C. Prodr. xiii. ii. 287 (1849).
(*T. siphonandrum*, Diels.)
T. sericostachyum, Nees in Lehm. Pl. Preiss, i. 627 (1845).
T. roseum, Moq. in D.C. Prodr. xiii. ii. 284 (1849).
T. fusiforme, R.Br. Prodr. 415 (1810).
T. gracile, R.Br. l. c. 415.

vi. *Squamigera*.

- T. Dummondii, Moq. in D.C. Prodr. xiii. ii. 292 (1849).
T. procerum, Diels, in Engler's Botan. Jahrb. xxxv. 191 (1904).
T. calostachyum, (F.v.M.) Benth. Fl. Austr. v. 236 (1870).
T. Carlsoni, F.v.M. in Viet. Nat. v. 74 (1888).
T. Fraseri, (A. Cunn.) Moq. in D.C. Prodr. xiii. ii. 295 (1849).

vii. *Spathulata*.

- T. spathulatum, R.Br. Prodr. 415 (1810).
T. pyramidatum, Moq. in D.C. Prodr. xiii. ii. 288 (1849).
T. holsericeum, Moq. in. l. c. 287.

viii. *Parviflora*.

- T. Cunninghamii, Benth. Fl. Austr. v. 238 (1870). (*P. lanatus* (A. Cunn.) Moq.)
T. villosus, Nees in Lehm. Pl. Preiss. i. 628 (1845).
T. brachyanthum, F.v.M.) Benth. Fl. Austr. v. 239 (1870).
T. arthrolasium, (F.v.M.) Benth. l. c. 239.
T. Forrestii, (F.v.M.) Gardn. comb. nov. (*Ptilotus Forrestii*, F.v.M.)
T. aervoides, F.v.M. Fragm. iii. 123 (1863).
T. caespitosum, (F.v.M.) Benth. Fl. Austr. v. 240 (1870).

ix. *Helichrysoidea*.

- T. helichrysoides, (F.v.M.) Benth. Fl. Austr. v. 241 (1870).

4. *PTILOTUS*, R.Br. Prodr. Fl. Nov. Holl. 415 (1810).

- P. capitatus, (F.v.M.) Gardn. comb. nov. (*P. psilotrichoides*, F.v.M.)
P. corymbosus, R.Br. Prodr. 415 (1810).
P. grandiflorus, F.v.M. Fragm. i. 237 (1859).
P. Johnstonianus, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 138 (1918).

- P. spicatus*, (F.v.M.) Benth Fl. Austr. v. 243 (1870).
P. petiolatus, Farman, in Bull. Herb. Boiss. ser. II. v. 1089 (1905).
P. Murrayi, (F.v.M.) Fragn. iii. 145 (1863).
P. decipiens, (Benth.) Gardh. comb. nov. (*P. Hoodii*, F.v.M.)
P. roseo-albus, Farman, in Bull. Herb. Boiss. ser. II. v. 1090 (1905).
P. gomphrenoides, (F.v.M.) Benth. Fl. Austr. v. 244 (1870).
P. latifolius, R.Br. in App. Sturt's Exped. ii. 88 (1849).
P. chamaecladus, Diels, in Engler's Botan. Jahrb. xxxv. 193 (1904).
P. villosiflorus, F.v.M. Fragn. iii. 125 (1863). (*P. macrotrichus*, F.v.M.)
 (*Alternanthera polyccephalus*, Benth.)
P. humilis, (Nees) F.v.M. Fragn. vi. 229 (1868).
5. *DIPTERANTHEMUM*, F.v.M. in Wing's Southern Science Record, iii. 281 (1884).
D. Crosslandi, F.v.M. in Wing's S. Sci. Rec. iii. 281 (1884).
6. *ACHYRANTHES*, Linn. Gen. ed. I. 34 (1737).
A. aspera, Linn. Sp. Pl. 204 (1753).
7. *ALTERNANTHERA*, Forsk. Fl. Ægypt-Arab. 28 (1775).
A. triandra, Lamarek, Encycl. Meth. i. 95 (1783). (*A. nodiflora*, R.Br.)
A. nana, R.Br. Prodr. 417 (1810).
A. leptophylla, Benth. Fl. Austr. v. 251 (1870).
A. longipes, (Moq.) Benth. l. c. 252.
8. *GOMPHRENA*, Linn. Gen. ed. I. 69 (1737).
G. canescens, R.Br. Prodr. 416 (1810).
G. flaccida, R.Br. l. c. 416.
G. affinis, (F.v.M.) Benth. Fl. Austr. v. 254 (1810).
G. platandra, F.v.M. in Trans. Roy. Soc. Vict. xxiii. 52 (1886).
G. brachystylis, F.v.M. Fragn. iii. 124 (1862).
G. alba, Farman, in Bull. Herb. Boiss. ser. II. v. 1090 (1905).
G. leptoclada, Benth. Fl. Austr. v. 255 (1870).
G. Cunninghamii, (Moq.) Druce, in Rep. Bot. Exch. Cl. Brit. Is. 1916, 625 (1917). (*G. Maitlandi*, F.v.M.)
G. tenella, (Moq.) Benth. Fl. Austr. v. 256 (1870).
G. conica, (R.Br.) Spreng. Syst. i. 824 (1825).
G. conferta, (Moq.) Benth. Fl. Austr. v. 257 (1870).
G. sordida, Farman, in Bull. Herb. Boiss. ser. II. v. 1091 (1905).
G. parviflora, Benth. Fl. Austr. v. 257 (1870).

Nyctaginaceae.

1. *BOERHAAVIA*, (Vaill). Linn. Syst. ed. I. (1735).
B. diffusa, Linn. Fl. Zeyl. 4 (1747).
B. repandra, Willd. Sp. Pl. i. 22 (1816).

Phytolaccaceae.

- **PHYTOLACCA*, (Tourn.) Linn. Syst. ed. I. (1735).
- **P. octandra*, Linn. (Japon.)
1. *DIDYMOTHECA*, Hook. fl. in Hook. Lond. Journ. Bot. vi. 278 (1747).
D. thesioides, Hook. fl. in Hook. Lond. Journ. Bot. vi. 279 (1847).
2. *GYROSTEMON*, Desf. in Mem. Mus. Par. vi. 16. t. 6 (1820).
G. subnudus, (Nees) Diels, in Engler's Botan. Jahrb. xxxv. 195 (1904).
(*G. brachystigma*, F.v.M.)
G. Sheathii, W. V. Fitzg. in Journ. Muell. Bot. Soc. W.A. i. no. ii. 81 (1903.)
G. australasicus, (Moq.) Hiemerl. in Engl. & Prantl. Nat. Pflanzenfam. iii. 1B. 12 (1889). (*G. cyclotheca*, Benth.)
G. ramulosus, Desf. in Mem. Mus. Par. vi. 17. t. 6 (1820).
G. Brownii, S. Moore, in Journ. Linn. Soc. xlv. 190 (1920).
3. *CODONOCARPUS*, A. Cunn. ex Hook. in Hook. Bot. Misc. i. 244 (1830).
C. cotinifolius, (Desf.) F.v.M. Pl. Viet. i. 200 (1862).

4. *TERSONIA*, Moq. in D.C. Prodr. xiii. ii. 40 (1849).
T. brevipes, Moq. in D.C. Prodr. xiii. ii. 40 (1849).
T. subvulvabilis, Benth, Fl. Austr. v. 150 (1870).

Aizoaceae.

1. *MOLLUGO*, Linn. Gen. Pl. ed. I. 336 (1737).
M. molluginis, (F.v.M.) Druce, Rep. Bot. Exch. Cl. Brit. Is. 1916. 636 (1917). (*M. trigastrotheca*, F.v.M.)
M. cervianna, Ser. in D.C. Prodr. i. 392 (1824).
M. hirta, Thunb. Prodr. Fl. Cap. i. 24 (1794). (*M. ginus*, A. Rich.)
(*Glinus lotooides*, Loef.)
M. Spergula, Linn. Sp. Pl. ed. alt. 131 (1762). (*Glinus Spergula* (L.) Pax.)
2. *MACARTHURIA*, Hueg. in Endl. Enum. Pl. Hueg. 11 (1837).
M. apetalis, Harv. in Hook. Kew Journ. vii. 55 (1855).
M. australis, Hueg. in Endl. Enum. Pl. Hueg. 11 (1837).
3. *SESUVIUM*, Linn. Syst. ed. X. 1058 (1759).
S. portulacastrum, Linn. Syst. ed. X. 1058 (1759).
4. *TRIANTHEMA*, (Savv.) Linn. Sp. Pl. ed. I. 223 (1753).
T. decandra, Linn. Mant. i. 70 (1771).
T. crystallina, Vahl. Symb. Bot. i. 32 (1790). (*T. glaucifolia*, F.v.M.)
T. pilosa, F.v.M. Fragm. i. 174 (1859).
T. oxycalyptra, F.v.M. l. c. 173.
T. turgidifolia, F.v.M. l. c. x. 83 (1786).
T. glossostigma F.v.M. in Wing's S. Sci. Rec. iii. 282 (1864).
5. *GUNNIA*, F.v.M. in Rep. Babb. Exped. 9 (1858).
G. Drummondii, Benth, Fl. Austr. iii. 327 (1866).
6. *GUNNIOPSIS*, Pax. in Engler et Prantl. Naturl. Pflanzenfam. iii. IB. 44 (1889). (*Aizoon*, Linn. p.p.)
G. intermedia, Diels, in Engler's Botan. Jahrb. xxxv. 197 (1904).
G. quadrifida, (F.v.M.) Pax. in Engl. et Prantl. Naturl. Pflanzenfam. iii. Ib. 44 (1889).
G. Rodwayi, (A. J. Ewart) Gardn. comb. nov.
G. zygophylloides, (F.v.M.) Maiden et Betche, Cens. N.S. Wales Pl. 74 (1916).
G. glabra, (Ewart) Gardn. comb. nov. (*Aizoon glabrum*, Ewart.)
7. *TETRAGONIA*, Linn. Syst. ed. I. (1735).
T. expansa, Murr. in Com. Gotting. vi. 13 (1783).
T. eremaea, Ostf. in Dansk. Vidensk. Selsk. Biol. Meddel. iii. 2. 59 (1921).
T. diptera, F.v.M. Fragm. xi. 8 (1878).
T. implexicoma, (Miq.) Hook. fl. Tasm. i. 148 (1859).
8. *MESEMBRYANTHEMUM*, (Breyne) Linn. Syst. ed. I. (1735).
**M. crystallinum*, Linn. (Graecia; Ins. Canar.; Afr. austr.; Calif.)
M. aequilaterale, Haw. Misc. Nat. 77 (1803).
M. australe, Soland, ex Forst. Prodr. 90 (1786).
**M. tumidulum*, Haw. (Afr. austr.)

Portulacaceae.

2. *CALANDRINIA*, H.B. et K. Nov. Gen. et. Sp. vi. 77 t. 526 (1823).
C. spergularina, F.v.M. Fragm. i. 175 (1859).
C. ptychosperma, F.v.M. l. c. iv. 137 (1864).
C. strophiolata, F.v.M. l. c. xi. 82 (1880).
C. Lehmanni, Endl. in Lehm. Pl. Preiss. ii. 235 (1847).
C. schistorrhiza, A. Morrison, in Journ. Bot. i. 164 (1912).
C. primuliflora, Diels, in Engler's Botan. Jahrb. xxxv. 198 (1904).
C. uniflora, F.v.M. in Trans. Phil. Inst. Viet. iii. 41 (1859).
C. Tepperiana, W. V. Fitzg. in Journ. Roy Soc. W.A. iii. 141 (1918).
C. balonensis, Lindl. in Mitch. Journ. Trop. Austr. 148 (1848).
C. polyandra, (Hook.) Benth. Fl. Austr. i. 172 (1863).
C. quadrivalvis, F.v.M. Fragm. i. 176 (1859).
C. liniflora, Fenzl. in Enum. Pl. Hueg. 52 (1837).

- C. polypetala*, Frenzl. in l. c. 51.
C. volubilis, Benth. Fl. Austr. i. 174 (1863).
C. Maryonii, S. Moore, in Journ. Linn. Soc. xlv. 164 (1920).
C. calyptrata, Hook. fil. in Icones Pl. t. 296 (1840).
C. cygnorum, Diels, in Engler's Botan. Jahrb. xxxv. 199 (1904).
C. pumila, F.v.M. Fragm. x. 68 (1876).
C. composita, Benth. Fl. Austr. i. 175 (1863).
C. corrigioloides, (F.v.M.) Benth. l. c. 175.
C. brevipedata, F.v.M. Fragm. x. 69 (1876).
C. granulifera, Benth, Fl. Austr. i. 176 (1863).
C. pygmaea, F.v.M. Fragm. i. 175 (1859).
C. Creethae, Tratman ex Morrison in Journ. Bot. l. 165 (1912).
2. *CLAYTONIA*, Linn. Gen. Pl. ed. I. 339 (1737).
C. australasica, Hook. fil. Icones Pl. t. 293 (1840).
 3. *PORTULACA*, (Tourn.) Linn. Syst. ed. I. (1735).
P. oleracea, Linn. Sp. Pl. 445 (1753).
P. napiformis, (F.v.M.) Benth. Fl. Austr. i. 169 (1863).
P. australis, Endl. Atakta. 7 t. 6 (1833).
P. tuberosa, Roxb. Hort. Beng. (91) Fl. Ind. ii. 464 (?).
P. digyna, F.v.M. Fragm. i. 170 (1859).
P. oligosperma, F.v.M. l. c. 170.
P. bicolor, F.v.M. l. c. 171.

Caryophyllaceae.

- *SILENE*, Linn. Syst. ed. I. (1735).
**S. gallica*, Linn. (Oriens.)
**S. nocturna*, Linn. (Reg. Mediterr.)
**S. vulgaris*, (Moench.) Garcke. (Europ.; Afr. bor.; Reg. Himal.)
**TUNICA*, Hall. Enum. Stirp. Helv. i. 381 (1742).
**T. prolifera*, Scop. (Europ.; Reg. Cauc.)
**SAPONARIA*, Linn. Syst. ed. I. (1735).
**S. Vaccaria*, Linn. (Europ.; As. Min.; Sibir.)
1. *STELLARIA*, Linn. Syst. Nat. ed. vi. (1748).
**S. media*, Cyrill. (Geront. temp.)
S. multiflora, Hook. in Comp. Bot. Mag. i. 275 (1735).
**CERASTIUM*, Linn. Syst. Nat. ed. i. (1735).
**C. glomeratum*, Thuill. (Reg. temp. et subtrop.)
 2. *SAGINA*, Linn. Syst. Nat. 8 (1735).
S. apetala, Arduino, Animad. Bot. Sp. alt. 22 (1764).
**SPERGULA*, Linn. Syst. ed. I. (1735).
**S. arvensis*, Linn. (Europ.)
 5. *DEYMARIA*, Willd. in Roem. et Schultze. Syst. v. 406 (1819).
D. filiformis, Benth, Fl. Austr. i. 162 (1863).
 4. *POLYCARPON*, Loef. Inter. Hisp. 7 (1758).
P. tetraphyllum, Loef. in Linn. Syst. ed. x. 881 (1759).
P. alsinaefolium, D.C. Prodr. iii. 376 (1828).
 5. *POLYCARPAEA*, Lamk. Journ. d'Hist. Nat. Par. ii. 8. t. 25 (1792).
P. longiflora, F.v.M. in Rep. Babb. Exped. 8 (1858).
P. synandra, F.v.M. in l. c. 8.
P. violacea, (Mart.) Benth. Fl. Austr. i. 165 (1863).
P. Holtzei, Maiden et Betche, in Ewart et Davies, Fl. N. Terr. 109 (1917).
P. staminodina, F.v.M. in Rep. Babb. Exped. 8 (1858).
P. breviflora, F.v.M. in l. c. 9.
P. spicata, Wight et Arn. in Ann. Nat. Hist. ser. I. iii. 91 (1839).
P. involucrata, F.v.M. in Rep. Babb. Exped. 9 (1858).

RANALES.

Nymphaceae.

1. *NYMPHAEA*, (Tourn.) Linn. Syst. ed. I. (1735).
N. stellata, Willd. Sp. Pl. ii. 1153 (1799). (*N. gigantea*, Hook.)

Ranunculaceae.

1. *CLEMATIS*, Linn. Gen. Pl. ed. I. 163 (1737).
C. pubescens, Hueg. Enum. Pl. i. (1837).
C. microphylla, D.C. Prodr. i. 147 (1818).
2. *RANUNCULUS*, (Tourn.) Linn. Syst. ed. I. (1735).
R. lappaceus, Sm. in Rees Cyclop. xxiv. n. 61 (1815).
R. hirtus, Banks et Soland in G. Forst. Fl. Ins. Austr. Prodr. 90 (1786).
(R. plebeius, R.Br.)
R. parviflorus, Linn. Sp. Pl. ed. ii. 780 (1762).
**R. muricatus*, Linn. (Europ.; Oriens.)

Menispermaceae.

1. *TINOSPORA*, Miers, in Ann. Nat. Hist. ser. II. vii. 38 (1851).
T. smilacina, Benth. in Journ. Linn. Soc. v. Suppl. ii. 52 (1861).
T. Walcottii (F.v.M.) Benth, Fl. Austr. i. 56 (1863).

Myristicaceae.

1. *MYRISTICA*, Linn. Gen. Ed. II. 524 (1742).
M. insipida, R.Br. Prodr. 400 (1810).

Lauraceae.

1. *CRYPTOCARYA*, R.Br. Prodr. Fl. Nov. Holl. 402 (1810).
C. glaucescens, R.Br. Prodr. 402 (1810).
2. *CASSYTHA*, Linn. Sp. Pl. ed. I. 35 (1753).
C. nodiflora, Meissn. in D.C. Prodr. xv. i. 252 (1864).
C. glabella, R.Br. Prodr. 404 (1810).
C. flava, Nees, in Lehm. Pl. Preiss. i. 620 (1845).
C. pubescens, R.Br. Prodr. 404 (1810).
C. strigosa, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 143 (1918).
C. filiformis, Linn. Sp. Pl. 35 (1753).
C. melantha, R.Br. Prodr. 404 (1810).
C. micrantha, Meissn. in D.C. Prodr. xv. i. 256 (1864).
C. coronata, Nees, in Lehm. Pl. Preiss. i. 620 (1845).
C. racemosa, Nees in l. c. 621.
C. pomiformis, Nees in l. c. 620.

Hernandiaceae.

1. *GYROCARPUS*, Jacq. Select. Ann. 282. t. 178 (1763).
G. americanus, Jacq. Select. Ann. 282. t. 178 (1763).

RHOEADALES.

Papaveraceae.

- *PAPAVER*, (Tourn.) Linn. Syst. ed. I. (1735).
**P. hybridum*, Linn. (Europ.; Syria; Afr. bor.)
**P. aculeatum*, Thunb. (Afr. austr. Austr.)
**ARGEMONE*, (Tourn.) Linn. Syst. ed. I. (1735).
**A. mexicana*, Linn. (Amer. bor.; Mexie.)

Fumariaceae.

- *FUMARIA*, (Tourn.) Linn. Syst. ed. I. (1735).
**F. capreolata*, Linn. (Europ.; Afr. bor.)
**F. muralis*, Sond. (Europ.)

Capparidaceae.

1. *CLEOME*, Linn. Syst. Nat. 9 (1735).
C. oxalidea, F.v.M. Fragm. i. 69 (1858).
C. tetrandra, Banks, in D.C. Prodr. i. 240 (1824).
C. viscosa, Linn. Sp. Pl. 672 (1753). (*Polanisia viscosa* (Linn.) D.C.)
2. *ROPERIA*, F.v.M. in Hook. Kew Journ. ix. 15 (1857).
R. cleomoides, F.v.M. in Hook. Kew Journ. ix. 15 (1857). (*Gynandropsis Muelleri*, Benth.)

3. *CAPPARIS*, (Tourn.) Linn. Syst. ed. I. (1735).
C. umbellata, R.Br. in D.C. Prodr. i. 247 (1824).
C. lasiantha, R.Br. in l. c. 247.
C. nummularia, R.Br. in l. c. 246.
C. spinosa, Linn. Sp. Pl. 503 (1753).
C. lucida, (R.Br.) Benth. Fl. Austr. i. 96 (1863).
C. umbonata, Lindl. in Mitch. Trop. Austr. 257 (1848).
4. *EMBLINGIA*, F.v.M. Fragm. ii. 2 (1860).
E. calceoliflora, F.v.M. Fragm. ii. 2. t. 11 (1860).

Cruciferae.

A. THELYPODIAE.

a. Heliophilinae.

- **HELIOPHILA*, (Burm. fil) Linn. Sp. Pl. ed. II. 926 (1763).
 **H. pusilla*, Linn. (Afr. aust.)

B. SINAPEAE.

a. Lepidiinae.

1. *LEPIDIUM*, (Tourn.) Linn. Syst. ed. I. (1735).
L. Merrallii, F.v.M. in Viet. Nat. vii. 114 (1890).
L. linifolium, (Desv.) Benth. Fl. Austr. i. 84 (1863).
L. leptopetalum, F.v.M. Pl. Viet. i. 48 (1860).
L. rotundum, D.C. Syst. Veg. ii. 537 (1818).
L. papillosum, F.v.M. in Linnaea, xxv. 370 (1852).
L. oxytrichum, Sprague, in Kew Bull. Misc. 123 (1915).
L. foliosum, Desv. in Journ. Bot. iii. 164. d. 180 (1813).
L. ambiguum, F.v.M. in Trans. Phil. Soc. Viet. i. 34 (1855).
L. pseudo-ruderales, Thell. in Neue Denkschr. Allg. Schweiz. Ges. Nat. Zurich, xli. i. 303 (1906). (*L. ruderales*, Linn. p.p.)
 **L. Draba*, Linn. (Europ.; Oriens.)
 **CORONOPUS*, (Rupp.) Gaertn. Fruct. ii. 293 (1791).
 **C. didymus*, (Linn.) Sm. (Cosmop.)

b. Sisymbriinae.

- **SISYMBRIUM*, (Tourn.) Linn. Syst. ed. I. (1735).
 **S. officinale*, Linn. (Europ.; Afr. bor.)
 **S. erysimoides*, Desv. (Reg. Meditter.; Afr. trop.; Arab.)
 **S. orientale*, Linn. (Europ.; Oriens.; Reg. Himal.)
2. *BLENNODIA*, R.Br. in Sturt. Exped. ii. App. 67 (1849). (*Sisymbrium* (T) Linn. p.p.) (*Erysimum*, F.v.M. p.p.)
B. trisetia, (F.v.M.) Benth. Fl. Austr. i. 74 (1863).
B. Richardsii, (F.v.M.) Gardn. comb. nov. (*Sisymbrium Richardsii*, F.v.M.)
B. Drummondii, (Turez.) Gardn. comb. nov. (*Sisymbrium brachypodum*, F.v.M.)
B. cardaminoides, (F.v.M.) Benth. Fl. Austr. i. 75 (1863).
 3. *GEOCOCCLUS*, J. Drumm. ex Harv. in Hook. Kew Journ. vii. 52 (1855).
G. pusillus, J. Drumm. ex Harv. in Hook. Kew Journ. vii. 52 (1855).
 4. *CAKILE*, (Tourn.) Miller, Gard. Diet. Abridg. Ed. IV. (1754).
C. maritima, Scop. Flor. Carn. ed. ii. 35 (1760).

c. Brassicinae.

5. *DIPLOTAXIS*, D.C. Syst. ii. 628 (1821).
D. tenuifolia, (Linn.) D.C. Syst. Veg. ii. 632 (1821).
 **D. muralis*, (Linn.) D.C. (Europ.)
 **BRASSICA*, (Tourn.) Linn. Syst. ed. I. (1735). (*Sinapis*, Linn.)
 **B. Tournefortii*, Gouan. (Reg. Meditter.; Oriens.; Ind. or.)
 **B. nigra*, Koch. (Cosmop.)
 **B. sinapistrum*, Boiss. (Europ.) (*Sinapis arvensis*, Linn.)
 **B. campestris*, Linn. (Cosmop.)
 **RAPHANUS*, (Tourn.) Linn. Syst. ed. I. (1735).
 **R. raphanistrum*, Linn. (Europ.)

d. Cardamininae.

6. *Nasturtium*, (Linn.) R.Br. in Ait. Hort. Kew ed. II. iv. 110 (1812).
N. officinale, R.Br. in Ait. Hort. Kew ed. II. iv. 111 (1812).

7. *CARDAMINE*, (Tourn.) Linn. Syst. ed. I. (1735).
C. dictyosperma, Hook. Journ. Bot. i. 246 (1834).
C. hirsuta, Linn. Sp. Pl. 655 (1753).
C. eustylis, F.v.M. in Trans. Viet. Inst. i. 114 (1854).

C. SCHIZOPETALAE.

a. Schizopetalinae.

8. *STENOPE TALUM*, R.Br. in D.C. Syst. Veg. ii. 513 (1821).
S. velutinum, F.v.M. Pl. Viet. i. 49 (1860).
S. lineare, R.Br. in D.C. Syst. Veg. ii. 513 (1821).
S. filifolium, Benth. Fl. Austr. i. 78 (1863).
S. sphaerocarpum, F.v.M. in Trans. Phil. Soc. Viet. i. 35 (1854).
S. nutans, F.v.M. Fragm. iii. 27 (1862).
S. robustum, Endl. in Enum. Pl. Hueg. 4 (1837).
S. pedicellare, (F.v.M.) Benth. Fl. Austr. i. 79 (1863).
S. croceum, Bunge, in Lehm. Pl. Preiss. i. 258 (1845).
9. *MENKEA*, Lehm. in Sem. Hort. Hamb. 8 (1843).
M. australis, Lehm. in Sem. Hort. Hamb. 8 (1843).
M. Coolgardiensis, S. Moore, in Journ. Linn. Soc. xxxv. 161 (1897).
M. draboides, (Hook. fil.) Benth. Fl. Austr. i. 80 (1863).
M. sphaerocarpa, F.v.M. Fragm. viii. 223 (1874).

D. HESPERIDEAE.

a. Capsellinae.

10. *HUTCHINSIA*, R.Br. in Ait. Hort. Kew ed. II. iv. 82 (1812).
H. procumbens, (Linn.) Desv. in Journ. Bot. iii. 168 (1814).
H. Drummondii, (Benth.) J. M. Black, Fl. S. Austr. 254 (1924).
11. *CAPSELLA*, Medicus, Pflanzen. Gattungen 85 (1792).
C. pilosula, F.v.M. Pl. Viet. i. 44 (1860).
**C. bursa-pastoris*, (Linn.) Medic. (Reg. temp.)

b. Alyssinae.

12. *ALYSSUM*, (Tourn.) Linn. Syst. ed. I. (1735).
A. minimum, Pallas, Reise Pror. Russ. Reich. iii. 746 (1776). (*A. linifolium*, Steph.)

Resedaceae.

- *RESEDA*, (Tourn.) Linn. Syst. ed. I. (1735).
**R. uteola*, Linn. (Europ.; Oriens.)
**R. alba*, Linn. (Europ.; Oriens.)

Droseraceae.

1. *ALDROVANDRA*, (Monti) Linn. Nov. Pl. Gen. 39 (1751).
A. vesiculosa, Linn. Sp. Pl. ed. I 281 (1753).
2. *DROSERA*, Linn. Gen. ed. I. 253 (1737).
 Subgen. I. *Rorella*, D.C.
 Sect. i. *Lamprolepis*, Planch.
D. paleacea, D.C. Prodr. i. 318 (1824).
D. parvula, Planch. in Ann. sc. nat. 3 ser. ix. 287 (1848).
D. pycnoblata, Diels, in Engler's Botan. Jahrb. xxxv. 207 (1904).
D. androsacea, Diels, in l. c. 205.
D. pulchella, Lehmann, Pugill. viii. 38 (1844).
D. leucoblata, Benth. Fl. Austr. ii. 458 (1864).
D. miniata, Diels, in Engler's Botan. Jahrb. xxxv. 206. t. 25A-D (1904).
D. dichrosepala, Turcz. in Bull. Soc. Nat. Mosc. xxvii. 2, 343 (1854).
D. scorpioides, Planch, in Ann. sc. nat. 3 ser. ix. 288 (1848).
D. Drummondii, Lehm. Pl. Preiss. ii. 235 (1847).
D. platystigma, Lehm. Pugill. viii. 37 (1844).
D. Sewelliae, Diels, in Engler's Botan. Jahrb. xxxv. 206. t. 25 (1904).
D. nitidula, Planch. in Ann. sc. nat. 3. ser. ix. 285 (1848).
D. omisssa, Diels, in Engler's Pflanzenreich Droseraceae iv. 112, 73 (1906).

- Sect. ii. *Thlocalyx*, Planch.
 D. *Burmanni*, Vahl. Symbol. iii. 50 (1794).
 Sect. iii. *Coelophylla*, Planch.
 D. *glanduligera*, Lehm. Pugill. viii. 37 (1844).
 D. *occidentalis*, A. Morrison, in Journ. Bot. l. 166 (1912).
 Sect. iv. *Anachnopus*, Planch.
 D. *indica*, Linn. Sp. Pl. ed. 1 282 (1753).
 Sect. v. *Rossolis*, Planch.
 D. *petiolaris*, R.Br. in D.C. Prodr. i. 318 (1824).
 Sect. vi. *Steclogyne*, Diels.
 D. *Hamiltonii*, C. Andrews, in Journ. Muell. Bot. Soc. West. Austr. Perth 81 (1903).
 Subgen. II. *Ergalcium*, D.C.
 Sect. vii. *Polypeltes*, Diels.
 D. *Banksii*, R.Br. ex D.C. Prodr. i. 319 (1824).
 D. *peltata*, Sm. in. Willd. Spec. pl. i. 1546 (1797).
 D. *Andersoniana*, (W.V.F.) Ewart et White in Proc. Roy. Soc. Vict. n. s. xxii. 93 (1909).
 D. *modesta*, Diels, in Engler's Botan. Jahrb. xxxv. 209 (1904).
 D. *sulphurea*, Lehm. Pugill. viii. 37 (1844).
 D. *Neesii*, Lehm. l. c. 42.
 D. *gigantea*, Lindl. Swan Riv. App. xx. n. 88 (1839).
 D. *myriantha*, Planch. in Ann. sc. nat. 3. ser. ix. 291 (1848).
 D. *bulbigena*, Morrison, in Trans. et Proc. Bot. Soc. Edinburgh xxii. 417 (1903).
 D. *pallida*, Lindl. Swan Riv. App. xx. n. 87 (1839).
 D. *Menziesii*, R.Br. in D.C. Prodr. i. 319 (1824). (*D. penicillaris*, Benth.)
 D. *macrantha*, Endl. Enum. pl. Hueg. 6 (1837).
 D. *stricticaulis*, (Diels) O. H. Sargent in Journ. Bot. li. 40 (1913).
 D. *subhirtella*, Planch. in Ann. sc. nat. 3 ser. ix. 292 (1848).
 D. *microphylla*, Endl. Enum. pl. Hueg. 6 (1837).
 D. *thysanosepala*, Diels, in Engler's Pflanzenreich Droseraceae iv. 112, 121 (1906).
 D. *Huegelii*, Endl. in Enum. Pl. Hueg. 6 (1837).
 D. *heterophylla*, Lindl. Swan Riv. App. 89 (1839).
 Sect. viii. *Erythrorrhiza*, Planch.
 D. *erythrorrhiza*, Lindl. Swan Riv. App. xx. 91 (1839).
 D. *squamosa*, Benth. Fl. Austr. ii. 463 (1864).
 D. *macrophylla*, Lindl. Swan Riv. App. xx. 91 (1839).
 D. *rosulata*, Lehm. Pugill. viii. 36 (1844).
 D. *bulbosa*, Hook. in Icon. pl. t. 375 (1841).
 D. *stolonifera*, Endl. Enum. pl. Hueg. 5 (1837).
 D. *platypoda*, Turcz. in Bull. Soc. Nat. Mose. xxvii. 2. 343 (1854).
 D. *ramellosa*, Lehm. Pugill. viii. 40 (1844).

ROSALES.

Crassulaceae.

1. *CRASSULA*, Linn. Syst. ed. I. (1735).
 C. *Miriamac*, Ostf. in Dansk. Bot. Arkiv. ii. n. 8. 42 (1918).
 C. *intricata*, (Nees) Ostf. l. c. 46. (*Tillaca intricata*, Nees.)
 C. *colorata*, (Nees) Ostf. l. c. 45. (*T. verticillata*, Benth.)
 C. *natans*, Thunb. Fl. Cap. 54 (1794).
 C. *recurva*, (Hook. f.) Ostf. in Dansk. Bot. Arkiv. ii. n. 8. 40. (*T. recurva*, Hook. f.)
 C. *bonariensis*, D.C.) Cambess in St. Hil. Fl. Bras. Mer. ii.
 C. *macrantha*, (Hook. f.) Diels et Pritzel in Engler's Botan. Jahrb. xxxv. 210 (1904).
 C. *pedicellosa*, (F.v.M.) Ostf. in Dansk. Bot. Arkiv. ii. n. 8. 42 (1918).

Cephalotaceae.

1. *CEPHALOTUS*, Labill. Nov. Holl. Pl. ii. 6. t. 145 (1806).
 C. *follicularis*, Labill. Nov. Holl. Pl. ii. 7. t. 145 (1806).

Saxifragaceae.

1. *EREMOSYNE*, Endl. in Enum. Pl. Hueg. 53 (1837).
E. pectinata, Endl. in Enum. Pl. Hueg. 53 (1837).

Pittosporaceae.

1. *PITTOSPORUM*, Banks, in Gaertn. Fruct. i. 286 (1788).
P. melanospermum, F.v.M. Fragm. i. 70 (1858).
P. phillyreoides, D.C. Prodr. i. 347 (1824).
2. *MARIANTHUS*, Hueg. in Enum. Pl. Hueg. 8 (1837).
M. procumbens, (Hook.) Benth. Fl. Austr. i. 117 (1863).
M. microphyllus, (Turcz.) Benth. l. c. 117.
M. villosus, (Turcz.) Benth. l. c. 117.
M. granulatus, (Turcz.) Benth. l. c. 118.
M. parviflorus, F.v.M. Fragm. ii. 144 (1861).
M. Drummondianus, (Putterl.) Benth. Fl. Austr. i. 119 (1863).
M. tenuis, Benth. Fl. Austr. i. 119 (1863). (*Billardiera parviflora*, D.C.)
M. coeruleo-punctatus, Klotzsch in Link. Kl. et Otto Ic. Pl. 28. t. 12 (1841).
M. gracilis, Ostf. in Det. Kgl. Dans. Videns. Selk. iii. 2. 67 (1921).
M. candidus, Hueg. in Enum. Pl. Hueg. 8 (1837).
M. erubescens, Putterl. in Endl. Nov. Stirp. Dec. 60 (1839).
M. ringens, (Drum. et Harv.) F.v.M. Fragm. i. 218 (1859).
M. lineatus, F.v.M. Fragm. i. 217 (1859).
M. pictus, Lindl. Swan Riv. App. 22 (1839).
3. *BURSARIA*, Cav. Ic. et Descr. Pl. iv. 30. t. 350 (1797).
B. spinosa, Cav. Ic. et Descr. Pl. iv. 30. t. 350 (1797).
4. *SOLLYA*, Lindl. in Bot. Reg. t. 1466 (1830).
S. fusiformis, (Labill.) Briq. in Ann. Conserv. et Jard. Bot. Genev. xx. 423 (1919). (*S. heterophylla*, Lindl.)
S. parviflora, Turcz. in Bull. Soc. Mosc. xxvii. 361 (1854).
S. erecta, C. Andrews, in Journ. Muell. Bot. Soc. W.A. i. 38 (1902).
5. *CHEIRANTHERA*, A. Cunn. in Brongn. Bot. Voy. Coq. t. 77 (1829).
C. parviflora, Benth. Fl. Austr. i. 128 (1863).
C. filifolia, Turcz. in Bull. Soc. Mosc. xxvii. 364 (1854).
6. *BILLARDIERA*, Sm. Sp. Bot. New Holl. i. t. 1 (1793).
B. latifolia, (Turcz.) Druce in Rep. Bot. Exch. Cl. Brit. Is. 1916. 609 (1917).
(*B. coriacea*, Benth.)
B. gracilis, Diels, in Engler's Botan. Jahrb. xxxv. 213 (1904).
B. variifolia, D.C. Prodr. i. 346 (1824).
B. angustifolia, (Putterl.) Gardn. comb. nov. (*B. Lehmanniana*, F.v.M.)
B. floribunda, (Putterl.) F.v.M. in Wing's S. Sci. Rec. ii. 1 (1882).
(*M. floribundus*, Putterl.)
7. *CITRIBATUS*, A. Cunn. in Loudon's Hort. Brit. Suppl. i. 585 (1832).
C. pauciflorus, A. Cunn. in Loudon's Hort. Brit. Suppl. i. 585 (1832).
8. *PEONAYA*, Hueg. Bot. Archiv. t. 6 (1837).
P. elegans, Hueg. Bot. Archiv. t. 6 (1837).

Byblidaceae.

1. *BYBLIS*, Salisb. Parad. Lond. t. 95 (1808).
B. liniflora, Salisb. Parad. Lond. t. 95 (1808).
B. gigantea, Lindl. in Swan Riv. App. 21 (1839).

Cunoniaceae.

1. *APHANOPETALUM*, Endl. Nov. Stirp. Dec. i. 34 (1839).
A. clematideum, (Drumm. et Harv.) Gardn. comb. nov. (*A. occidentale*, F.v.M.)

Rosaceae.

- **EUBUS*, (Tourn.) Linn. Syst. ed. I. (1735).
**E. fruticosus*, Linn. (Europ.)
**EOSA*, (Tourn.) Linn. Syst. ed. I. (1735).
**E. rubiginosa*, Linn. (Europ.; Reg. Caucas.)

1. *ACAENA*, Linn. Mantiss. ii. 200 (1771).
A. ovina, A. Cunn. in Field's N.S. Wales 358 (1825).
2. *STYLOBASIUM*, Desf. in Mem. Mus. Par. v. 37. t. 2 (1819).
S. spathulatum, Desf. in Mem. Mus. Par. v. 37. t. 2 (1819).
S. lineare, Nees in Lehm. Pl. Preiss. i. 95 (1845).

LEGUMINOSAE.

Mimosaceae.

1. *PITHECOLOBIUM*, Mart. in Fl. xx. (1837).
P. monoliferum, (Hassk.) Benth. in Hook. Lond. Journ. iii. 211 (1844).
2. *ALBIZZIA*, Durazz in Mag. Tose. III. iv. 11 (1772).
A. distachya, (Vent.) Macbride in Contrib. Gray Herb. n. s. lix. 3 (1919).
(A. lophantha, Benth.)
A. procera, (Willd.) Benth. in Hook. Lond. Journ. iii. 88 (1844).
A. lebbek (Willd.) Benth l. c. 87.
3. *ACACIA*, (Tourn.) Willd. Sp. Pl. iv. 1049 (1805).

PHYLLODINEAE.

Series I. *Alatae*.

- A. glaucoptera, Benth. in Linnaea xxvi. 604 (1854).
- A. alata, R.Br. in Ait. Hort. Kew ed. 3. v. 464 (1813).
- A. diptera, Lindl. Swan Riv. App. 15 (1839).
- A. stenoptera, Benth. in Hook. Lond. Journ. i. 325 (1842).

Series II. *Continuae*.

- A. incurva, Benth. in Hook. Lond. Journ. i. 325 (1842).
- A. trigonophylla, Meissn. in Lehm. Pl. Preiss. ii. 199 (1846).
- A. imabilis, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 289 (1904).

Series III. *Pungentes*.A. *Plurinerves*.

- A. latipes, Benth. in Hook. Lond. Journ. i. 334 (1842).
- A. comans, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 5 (1904).
- A. cochlearis, (Labill.) Wendl. Comm. Acac. Aphyll. 15 (1820).
- A. colletioides, (A. Cunn.) Benth. in Hook. Lond. Journ. i. 336 (1842).
- A. acellerata, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 2 (1927).
- A. periculosa, S. Moore, in Journ. Linn. Soc. xlv. 171 (1920).
- A. Mackeyana, Ewart et Jean White, in Proc. Roy. Soc. Vict. xxii. (n.s.) 6 (1909).
- A. sedifolia, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 3 (1927).
- A. striatulata, Benth. in Hook. Lond. Journ. i. 336 (1842).
- A. campylophylla, Benth. in Linnaea xxvi. 605 (1853).
- A. teretifolia, Benth. in Hook. Lond. Journ. i. 326 (1842).
- A. sulcata, R.Br. in Ait. Hort. Kew ed. 3 v. 460 (1813).
- A. costata, Benth. in Hook. Lond. Journ. i. 339 (1842).
- A. pulviniformis, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 1 (1927).
- A. acuaria, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 7 (1904).
- A. Andrewsii, W. V. Fitzg. in l. c. 6.
- A. acutata, W. V. Fitzg. in l. c. 6.
- A. barbinervis, Benth. in Hook. Lond. Journ. i. 326 (1842).
- A. ataxiphylla, Benth. in Linnaea xxvi. 605 (1853).
- A. Baxteri, Benth. in Hook. Lond. Journ. i. 327 (1842).

B. *Uninerves*.

- A. auronitens, Lindl. Swan. Riv. App. 15 (1839).
- A. quadrisulcata, F.v.M. Fragm. iii. 127 (1863).
- A. tamminensis, E. Pritzel in Engler's Botan. Jahrb. xxxv. 290 (1904).
- A. calcarata, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 2 (1927).
- A. collina, E. Pritzel in Engler's Botan. Jahrb. xxxv. 291 (1904).
- A. erioclada, Benth. in Linnaea xxvi. 606 (1853).
- A. excentrica, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 4 (1927).
- A. patens, F.v.M. in Journ. Linn. Soc. iii. 120 (1858).
- A. loricina, Meissn. in Lehm. Pl. Preiss. i. 6 (1845).
- A. tetragonophylla, F.v.M. in Journ. Linn. Soc. iii. 121 (1858).
- A. genistoides, (F.v.M.) Benth. Fl. Austr. ii. 330 (1864).

- A. *inaequiloba*, W. V. Fitzg. in Journ. Bot. i. 18 (1912).
- A. *nigripilosa*, Maiden in Journ. Roy. Soc. N.S. Wales liii. 172 (1920).
- A. *Prainii*, Maiden in l. c. li. 238 (1917).
- A. *sphaelata*, Benth. in Hook. Lond. Journ. i. 338 (1842).
- A. *ingrata*, Benth. Fl. Austr. ii. 331 (1864).
- A. *inops*, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 4 (1927).

Series IV. Calamiformes.

A. Subaphyllae.

- A. *volubilis*, F.v.M. Fragm. x. 98 (1877).
- A. *tetragonocarpa*, Meissn. in Lehm. Pl. Preiss. i. 4 (1844).
- A. *restiacea*, Benth. in Hook. Lond. Journ. i. 379 (1842).

B. Plurinerves.

- A. *squamata*, Lindl. Swan. Riv. App. 15 (1839).
- A. *exocarpioides*, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 7 (1904).
- A. *brachyphylla*, Benth. in Linnaea xxvi. 615 (1853).
- A. *Ewartiana*, (W. V. Fitzg.) Ewart et J. White in Proc. Roy. Soc. Vict. xxiii. (n.s.) 286 (1911).
- A. *Dielsii*, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 294 (1904).
- A. *Bynoeana*, Benth. in Linnaea xxvi. 614 (1853).
- A. *Helmsiana*, Maiden in Journ. Roy. Soc. N.S. Wales liii. 174 (1920).
- A. *triptycha*, (F.v.M.) Benth. Fl. Austr. ii. 337 (1864).
- A. *fragilis*, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 5 (1927).
- A. *subflexuosa*, Maiden in Journ. Roy. Soc. N.S. Wales liii. 178 (1920).
- A. *leptoneura*, Benth. in Hook. Lond. Journ. i. 341 (1842).
- A. *eremophila*, (W. V. Fitzg.) Ewart & J. White in Proc. Roy. Soc. Vict. ns. xxiii. 286 (1911).
- A. *Sowdeni*, Maiden in Journ. Roy. Soc. N.S. Wales, liii. 180 (1920).
- A. *abrupta*, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 6 (1927).
- A. *viscifolia*, Maiden et Blakely in l. c. 7.
- A. *densiflora*, Morrison, in Scott. Bot. Rev. i. 96 (1912).
- A. *papyrocarpa*, Benth. Fl. Austr. ii. 338 (1864).

C. Uninerves.

- A. *scirpifolia*, Meissn. in Bot. Zeit. 10 (1855).
- A. *extensa*, Lindl. Swan. Riv. App. 15 (1839).
- A. *longispinea*, Morrison, in Scott. Bot. Rev. i. 96 (1912).
- A. *gonophylla*, Benth. in Linnaea xxvi. 613 (1853).
- A. *prismifolia*, E. Pritzel in Engler's Botan. Jahrb. xxxv. 293 (1904).
- A. *polychroa*, E. Pritzel in l. c. 293.
- A. *ericifolia*, Benth. in Hook. Lond. Journ. Bot. i. 345 (1842).
- A. *psammophila*, E. Pritzel in Engler's Botan. Jahrb. xxxv. 294 (1904).
- A. *Maxwelli*, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 7 (1927).
- A. *uncinella*, Benth. in Linnaea xxvi. 613 (1853).
- A. *enervia*, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 8 (1927).
- A. *Inceana*, Domin, New Add. Fl. W. Austr. ii. 43 (1923). (*A. Inceae*, Maid et Blakely.)
- A. *assimilis*, S. Moore, in Journ. Linn. Soc. xlv. 172 (1920).

Series V. Brunioideae.

- A. *Rossei*, F.v.M. in Vict. Nat. July (1893).
- A. *cedroides*, Benth. in Schlecht. Linnaea xxvi. 615 (1853).
- A. *lycopodifolia*, A. Cunn. in Hook. Ic. Plant. t. 172 (1837).
- A. *hippuroides*, (Heward) Benth. in Hook. Lond. Journ. i. 344 (1842).
- A. *sorophylla*, E. Pritzel in Engler's Botan. Jahrb. xxxv. 296 (1904).
- A. *cometes*, C. Andrews, in Journ. W.A. Nat. Hist. Soc. i. 39 (1904).

Series VI. Uninerves.

A. Spinescentes.

- A. *scabra*, Benth. in Schlecht. Linnaea xxvi. 605 (1853).
- A. *nodiflora*, Benth. l. c. 621.
- A. *oxyclada*, (F.v.M.) Benth. Fl. Austr. ii. 341 (1864).
- A. *leptacantha*, E. Pritzel in Engler's Botan. Jahrb. xxxv. 296 (1904).
- A. *ulicina* Meissn. in Lehm. Pl. Preiss. ii. 202 (1847).
- A. *spinosissima*, Benth. in Schlecht. Linnaea xxvi. 621 (1853). (*A. ferocior*, Maiden.)

- A. Basedowii, Maiden in Journ. Roy. Soc. N.S. Wales, liii. 197 (1920).
 A. erinacea, Benth. in Hook. Lond. Journ. i. 360 (1842).
 A. intricata, S. Moore, in Journ. Linn. Soc. xlv. 172 (1920).

B. *Armatae*.

- A. Huegelii, Benth. in Endl. Enum. Pl. Hueg. 42 (1837).
 A. nervosa, D.C. Mem. Leg. xii. 444 (1825).
 A. obovata, Benth. in Hook. Lond. Journ. i. 329 (1842).
 A. congesta, Benth. l. c. 327.
 A. dermatophylla, Benth. Fl. Austr. ii. 346 (1864).
 A. armata, R.Br. in Ait. Hort. Kew. ed. 3. v. 463 (1813).
 A. idiomorpha, (A. Cunn.) Benth. in Hook. Lond. Journ. i. 329 (1842).
 A. Shuttleworthii, Meissn. in Lehm. Pl. Preiss. i. 7 (1844).
 A. dubia, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 9 (1904).
 A. Gregorii, F.v.M. Fragm. iii. 47 (1862).
 A. pilosa, Benth. in Linnaea xxvi. 607 (1853).
 A. crispula, Benth. l. c. 607.
 A. crassistipula, Benth. in Hook. Lond. Journ. i. 326 (1842).

C. *Triangulares*.

- A. Cliftoniana, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 10 (1904).
 A. hastulata, Smith in Rees Cyclop. xxxix. Suppl. (1819).
 A. horridula, Meissn. in Lehm. Pl. Preiss. i. 9 (1844).
 A. divergens, Benth. in Hook. Lond. Journ. i. 331 (1842).
 A. biflora, R.Br. in Ait. Hort. Kew ed. 3. v. 463 (1813).
 A. Mooreana, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 10 (1904).
 A. decipiens, R.Br. in Ait. Hort. Kew ed. 3. v. 463 (1813).
 A. vernicosa, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 11 (1904).
 A. cuneata, Benth. in Endl. Enum. Pl. Hueg. 42 (1837).
 A. dilatata, Benth. in Schlecht. Linnaea xxvi. 608 (1853).
 A. Rendlei, Maiden in Journ. Roy. Soc. N.S. Wales, li. 241 (1917).
 A. orbifolia, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 9 (1927).
 A. bidentata, Benth. in Hook. Lond. Journ. Bot. i. 333 (1842).
 A. flabellifolia, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 11 (1904).
 A. acanthoclada, F.v.M. Fragm. iii. 127 (1863).
 A. Forrestiana, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 298 (1904).

D. *Brevifoliae*.

- A. lachnophylla, F.v.M. in Wing's S.Sc. Rec. ii. 150 (1882).
 A. triquetra, Benth. in Hook. Lond. Journ. Bot. i. 358 (1842).
 A. chrysopoda, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 10 (1927).
 A. ligustrina, Meissn. in Lehm. Pl. Preiss. ii. 203 (1847).
 A. saxatilis, S. Moore, in Journ. Linn. Soc. xlv. 173 (1920).
 A. glabriflora, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 12 (1927).
 A. Meissneri, Lehm. Del. Sem. Hort. Bot. Hamb. 1842.
 A. Merriekae, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 13 (1927).
 A. sericocarpa, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 9 (1904).
 A. Merrallii, F.v.M. in Proc. Linn. Soc. N.S. Wales, 2nd. ser. v. 18 (1890).
 A. oblonga, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 10 (1927).
 A. Tysoni, Luchmann in Viet. Nat. xiii. 112 (1897).
 A. pallidiramosa, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 12 (1927).
 A. anceps, D.C. Mem. Leg. 446 (1825).
 A. undulifolia, Fraser, in Lodd. Bot. Cab. xvi. 1544 (1829).
 A. brachyclada, W. V. Fitzg. in Journ. Bot. l. 20 (1912).
 A. dura, Benth. in Schlecht. Linnaea xxvi. 622 (1853).
 A. spathulata, (F.v.M.) Benth. Fl. Austr. ii. 356 (1864).
 A. porphyrochila, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 290 (1904).

E. *Angustifoliae*.

- A. glutinosissima, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 13 (1927).
 A. acutifolia, Maiden et Blakely l. c. 14.
 A. ramosissima, Benth. in Hook. Lond. Journ. Bot. i. 356 (1842).
 A. cupularis, Domin, New Add. Fl. W. Austr. 45 (1923).
 A. Dempsteri, F.v.M. Fragm. xi. 65 (1879).
 A. sentis, F.v.M. Gen. Rep. 11 (1854).
 A. dentifera, Benth. in Maund. Bot. iv. t. 179 (1839).

F. Racemosae.

- A. amblyphylla*, F.v.M. in Wing's S. Sc. Rec. ii. 149 (1882).
A. subglaucula, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 14 (1927).
A. microbotrya, Benth. in Hook. Lond. Journ. Bot. i. 353 (1842).
A. aestivalis, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 300 (1904).
A. chrysella, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 16 (1927).
A. saligna, Wendl. Comm. Acac. 26 (1820).
A. cyanophylla, Lindl. Bot. Reg. 49 (1835).
A. notabilis, F.v.M. Fragm. i. 6 (1858).
A. validinervia, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 15 (1927).
A. Steedmani, Maiden et Blakely in l. c. 16.
A. hakeoides, A. Cunn. in Hook. Lond. Journ. Bot. i. 354 (1842).
A. salicina, Lindl. in Mitch. Three Exped. ii. 20 (1838).
A. Blakelyi, Maiden in Journ. Roy. Soc. N.S. Wales, li. 246 (1917).
A. rostellifera, Benth. in Hook. Lond. Journ. Bot. i. 356 (1842).
A. sclerosperma, F.v.M. in Wing's S. Sc. Rec. ii. July, 1882. (*A. spodioperna*, F.v.M., and *A. leucosperma*, F.v.M.)
A. crassiuscula, Wendl. Comm. Acac. 31. t. 8 (1820).
A. Harveyi, Benth. Fl. Austr. ii. 368 (1864).
A. iteaphylla, F.v.M. in Schlecht. Linnaea xxvi. 617 (1853).
A. bracteata, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 18 (1927).
A. subcaerulea, Lindl. Bot. Reg. t. 1075 (1827).
A. Graffiana, F.v.M. in Melb. Chem. n.s. ii. 118 (1887).
A. Lindleyi, Meissn. in Lehm. Pl. Preiss. i. 14 (1844).
A. leptopetala, Benth. in Schlecht. Linnaea, xxvi. 619 (1853).
A. pyrifolia, D.C. Mem. Leg. 447 (1825).
A. myrtifolia, Willd. Sp. Pl. iv. 1054 (1805).

*Series VII. Plurinerves.**A. Armatae.*

- A. dictyoneura*, E. Pritzel in Engler's Botan. Jahrb. xxxv. 303 (1904).
A. scalpelliformis, Meissn. in Lehm. Pl. Preiss. ii. 200 (1847).
A. urophylla, Benth. in Bot. Reg. 24 (1841).

B. Triangulares.

- A. adnata*, F.v.M. in Melb. Chemist July, 1882.
A. deltoidea, A. Cunn. in G. Don. Syst. ii. 401 (1832). (*A. stipulosa*, F.v.M.)
A. Luehmanni, F.v.M. Fragm. xi. 116 (1881).
A. Froggattii, Maiden in Journ. Roy. Soc. N.S. Wales, liii. 204 (1920).

C. Brevisfoliae.

- A. loxophylla*, Benth. in Schlecht. Linnaea xxvi. 625 (1853).
A. setulifera, Benth. in l. c. 625.
A. translucens, A. Cunn. in Hook. Ic. Plant. t. 160 (1837).
A. impressa, F.v.M. in Journ. Linn. Soc. iii. 133 (1858).

D. Oligoneuræ.

- A. bivenosa*, D.C. Prodr. ii. 452 (1825).
A. nitidula, Benth. Fl. Austr. ii. 381 (1864).
A. deflexa, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 18 (1927).
A. Kingiana, Maiden et Blakely, l. c. 19.
A. heteroclitia, Meissn. in Lehm. Pl. Preiss. i. 318 (1845).
A. Ridleyana, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 12 (1904).
A. Benthamii, Meissn. in Lehm. Pl. Preiss. i. 11 (1844).
A. obtecta, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 20 (1927).
A. eremaea, Cecil Andrews, in Journ. W.A. Nat. Hist. Soc. i. 40 (1904).

E. Microneuræ.

- A. ancistrophylla*, C. Andrews, in Journ. W.A. Nat. Hist. Soc. i. 40 (1904).
A. resinostipulea, W. V. Fitzg. in l. c. i. 12.
A. leptospermoides, Benth. in Schlecht. Linnaea xxvi. 626 (1853).
A. Osswaldi, F.v.M. Pl. of Vict. ii. 27 (1860).
A. Loderi, Maiden in Journ. Roy. Soc. N.S. Wales, liii. 209 (1919).
A. pachyacra, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 21 (1927).
A. subangularis, Maiden et Blakely in l. c. 21.
A. lineolata, Benth. in Schlecht. Linnaea xxvi. 626 (1853).

- A. coriacea*, D.C. Mem. Leg. 446 (1825).
A. stenophylla, A. Cunn. in Hook. Lond. Journ. Bot. i. 366 (1842).

F. Nervosae.

- A. hemignosta*, F.v.M. in Journ. Linn. Soc. iii. 134 (1858).
A. sclerophylla, Lindl. in Mitch. Three Exped. ii. 138 (1838).
A. heteroneura, Benth. in Schlecht. Linnaea. xxvi. 624 (1853).
A. ixiophylla, Benth. in Hook. Lond. Journ. Bot. i. 364 (1842).
A. duriuscula, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 15 (1904).
A. multilincata, W. V. Fitzg. in l. c. 13.
A. dictyophleba, F.v.M. Fragm. iii. 128 (1863).
A. cyclopis, A. Cunn. in Loudon Hort. Brit. 407 (1830).
A. implexa, Benth. in Hook. Lond. Journ. Bot. i. 368 (1842).

G. Dimidiatae.

- A. platycarpa*, F.v.M. in Journ. Linn. Soc. iii. 145 (1858).
A. sericata, A. Cunn. ex Benth. in Hook. Lond. Journ. Bot. i. 380 (1842).
 (*A. flavescens*, A. Cunn.)
A. retivenia, F.v.M. Fragm. iii. 128 (1863).
A. dincura, F.v.M. in Journ. Linn. Soc. iii. 130 (1858).

Series VIII. Juliflorae.

A. Spicatae.

- A. Kochii*, (W. V. Fitzg.) Ewart et J. White, in Proc. Roy. Soc. Vict. n.s. xxiii. 285 (1911).

B. Rigidulae.

- A. eraspodocarpa*, F.v.M. in Melb. Chemist. n.s. ii. 73 (1887). (*A. euphleba*, W. V. Fitzg.)
A. Wickhami, Benth. in Hook. Lond. Journ. Bot. i. 379 (1842).
A. lysiphloea, F.v.M. in Journ. Linn. Soc. iii. 137 (1858).
A. linarioides, Benth. in Hook. Lond. Journ. Bot. i. 371 (1842).
A. Kelléri, F.v.M. in Proc. Linn. Soc. N.S. Wales xvi. 468 (1891).
A. stipuligera, F.v.M. in Journ. Linn. Soc. iii. 144 (1858).
A. ptychophylla, F.v.M. in l. c. 142.
A. sphaerostachya, E. Pritzel in Engler's Botan. Jahrb. xxxv. 305 (1904).
A. xiphophylla, E. Pritzel, in l. c. 305.
A. stigmatophylla, A. Cunn. in Hook. Lond. Journ. Bot. i. 377 (1842).
A. Chisholmi, Bail. in Queensland Agric. Journ. iv. 47 (1899).
A. acradenia, F.v.M. in Journ. Linn. Soc. iii. 142 (1858).
A. curvicarpa, W. V. Fitzg. in Proc. Roy. Soc. N.S. Wales, li. 114 (1917).
A. leptophleba, F.v.M. in Journ. Linn. Soc. iii. 143 (1858).
A. megalantha, F.v.M. in l. c. 143.

C. Tetramerae.

- A. neurophylla*, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 13 (1904).
A. malloclada, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 23 (1927).
A. eochloocarpa, Meissn. in Bot. Zeit. 10 (1855).

D. Stenophyllae.

- A. Coolgardiensis*, Maiden in Journ. Roy. Soc. N.S. Wales, liii. 211 (1919).
A. aciphylla, Benth. in Schlecht. Linnaea xxvi. 627 (1853).
A. filifolia, Benth. in Hook. Lond. Journ. Bot. i. 369 (1842).
A. ephedroides, Benth. in l. c. 370.
A. Tratmaniana, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 8 (1904).
A. Hynesiana, W. V. Fitzg. Journ. Bot. 1. 20 (1912).
A. merinthophora, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 307 (1904).
A. Burkittii, (F.v.M.) Benth. Fl. Austr. ii. 400 (1864). (*A. Randelliana*, W. V. Fitzg.)
A. microneura, Meissn. in Lehm. Pl. Preiss. i. 19 (1844).
A. Jutsoni, Maiden, in Journ. Roy. Soc. N.S. Wales, li. 262 (1917).
A. resinomarginea, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 15 (1904).
A. palustris, Luehmann in Vict. Nat. Dec. 1896.
A. Grasbyi, Maiden in Journ. Roy. Soc. N.S. Wales, li. 251 (1917).
A. cyperophylla, (F.v.M.) Benth. Fl. Austr. ii. 400 (1864).
A. longiphyllodinea, Maiden in Journ. Roy. Soc. N.S. Wales, li. 254 (1917).
A. inophloia, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 25 (1927).
A. sessilisipica, Maiden et Blakely in l. c. 23.

- A. multispicata*, Benth. Fl. Austr. ii. 400 (1864).
A. pityoides, F.v.M. in Journ. Linn. Soc. iii. 135 (1858).
A. xylocarpa, A. Cunn. in Hook. Lond. Journ. Bot. i. 370 (1842).
A. Kimberleyensis, W. V. Fitzg. in Journ. Roy. Soc. N.S. Wales, li. 112 (1917).
A. ramulosa, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 15 (1904).
A. linophylla, W. V. Fitzg. in l. c. 16.
A. Websteri, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 25 (1917).
A. Jibberdingensis, Maiden et Blakely in l. c. 29.
A. oncinophylla, Lindl. (Bot. Reg. xxv.) Swan Riv. App. 15 (1839).
A. Fauntleroyi, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 26 (1927).
A. Tanumbirincense, Maiden in Ewart & Davies, Flora, N. Terr. 338 (1917).
A. arida, Benth. in Hook. Lond. Journ. Bot. i. 370 (1842).
A. trachycarpa, E. Pritzel in Engler's Botan. Jahrb. xxxv. 308 (1904).
A. aneura, F.v.M. in Schlecht. Linnæa xxvi. 627 (1853).
A. sibirica, S. Moore, in Journ. Linn. Soc. xxxiv. 189 (1898).
A. brachystachya, Benth. Fl. Austr. ii. 403 (1864).
A. cibaria, F.v.M. in Melb. Chemist. July, 1882.

E. Falcatae.

- A. Clementi*, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 26 (1927).
A. Cuthbertsoni, Luchmann in Vict. Nat. xiii. 117 (1897).
A. cognata, Maiden et Blakely, in Journ. Roy. Soc. W.A. xiii. 28 (1927).
A. lasiocalyx, C. Andrews, in Journ. W.A. Nat. Hist. Soc. i. 41 (1904).
A. doratoxyton, A. Cunn. in Field's N.S.W. 345 (1825).
A. proxima, Maiden in Journ. Roy. Soc. N.S. Wales, li. 105 (1917). (*A. camptoclada*, E.P.)
A. adsurgens, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 28 (1927).
A. eriopoda, Maiden et Blakely in l. c. 27.
A. numerosa, Maiden et Blakely in l. c. 27.
A. acuminata, Benth. in Hook. Lond. Journ. i. 373 (1862). (*A. Oldfieldii*, Benth.)
A. signata, F.v.M. Fragm. iv. 7 (1864).
A. Stowardi, Maiden in Journ. Roy. Soc. N.S. Wales, li. 269 (1917).
A. Beauverdiana, Ewart & Sharman in Proc. Roy. Soc. Viet. n.s. xxvii. 230 (1916).
A. stereophylla, Meissn. in Lehm. Pl. Preiss. ii. 203 (1847).
A. delibrata (A. Cunn.) Benth. in Hook. Lond. Journ. i. 374 (1842).
A. quadrimarginea F.v.M. Fragm. x. 31 (1876).
A. Helmsleyi, Maiden in Journ. Roy. Soc. N.S. Wales, li. 87 (1917).
A. plectocarpa, (A. Cunn.) Benth. in Hook. Lond. Journ. i. 375 (1842).
A. lentiginea, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 30 (1927).
A. pachycarpa, F.v.M. in Journ. Linn. Soc. iii. 139 (1858).
A. anceistrocarpa, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 31 (1927).
A. Cunninghamii, Hook. Ic. Plant. t. 165 (1837).
A. Gardneri, Maiden et Blakely in Journ. Roy. Soc. W.A. xiii. 32 (1927).
A. tumida, F.v.M. in Journ. Linn. Soc. iii. 144 (1858).
A. oncinocarpa, Benth. in Hook. Lond. Journ. Bot. i. 378 (1842).
A. aulacocarpa, (A. Cunn.) Benth. l. c. 378.
A. retinervis, Benth. in l. c. 379.

F. Dimidiatae.

- A. latifolia*, Benth. in Hook. Lond. Journ. Bot. i. 382 (1842).
A. holsericea, A. Cunn. in G. Don. Gen. Syst. ii. 407 (1832).
A. denticulosa, F.v.M. Fragm. x. 32 (1876).
A. humifusa, A. Cunn. in Hook. Lond. Journ. Bot. i. 382 (1842).

BIPINNATAE.

Series IX. Botryocephalae.

- A. pachyphloia*, W. V. Fitzg. in Journ. Roy. Soc. N.S. Wales li. 116 (1917).

Series X. Pulchellae.

- A. pulchella*, Br. in Ait. Hort. Kew ed. 3. v. 464 (1813). (*A. Goodbyi*, Domin.)
A. pentadenia, Lindl. Bot. Reg. t. 1521 (1832).
A. Gilberti, Meissn. in Lehm. Pl. Preiss. ii. 204 (1847).

- A. nigricans, R.Br. in Ait. Hort. Kew ed. 3. v. 465 (1813).
 A. Taylorina, F.v.M. in Wing's S. Sc. Rec. July. 1882.
 A. Drewiana, W. V. Fitzg. in Journ. Roy. Soc. N.S. Wales, li. 273 (1917).
 A. obscura, D.C. Not. 6 Pl. Rar., Jard. Genev. 23. t. 3 (1829).
 A. insolita, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 310 (1904).
 A. strigosa, Link. Enum. Pl. Hort. Berol. 444 (1822).
 A. Drummondii, Lindl. Swan Riv. App. 15 (1839).
 A. Moirii, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 312 (1904).
 A. grisea, S. Moore, in Journ. Linn. Soc. xlv. 174 (1920).

Series XI. Gumniferae.

- A. Farnesiana, Willd. Sp. Pl. iv. 1083 (1805).
 A. suberosa, (A. Cunn.) Benth. in Hook. Lond. Journ. Bot. i. 499 (1842).
 A. Bidwillii, Benth. in Schlecht. Linnaea xxvi. 629 (1853).
 A. pallida, F.v.M. in Journ. Linn. Soc. iii. 147 (1858).
 4. *NEPTUNIA*, Lour, Fl. Cochinch. ii. 653 (1790).
 N. gracilis, Benth. in Hook. Journ. Bot. iv. 355 (1842).
 N. monosperma, (F.v.M.) Benth. Fl. Austr. ii. 300 (1864).
 5. *DICHROSTACHYS*, Wight et Arnott Prodr. 271 (1834).
 D. spicata, (F.v.M.) Gardn. comb. nov. (*D. Muelleri*, Benth.)

Caesalpiniaceae.

1. *ERYTHROPHLEUM*, Afzel ex R.Br. in Tuckey's Narr. Congo. 430 (1818).
 E. chlorostachys, (F.v.M.) Hennings ex Taub. in Engler & Prantl, Nat. Pflanzenfam. iii. 3. 127 (1892). (*E. Laboucherii*, F.v.M.)
 2. *BAUHINIA*, Linn. Gen. ed. I. 126 (1736).
 B. Cunninghamii, Benth. Fl. Austr. ii. 295 (1864).
 3. *LABICHEA*, Gaud. in D.C. Prodr. ii. 507 (1825).
 L. cassioides, Gaud. in D.C. Prodr. ii. 507 (1825).
 L. lanceolata, Benth. in Enum. Pl. Hueg. 41 (1837).
 L. punctata, Benth. in Lindl. Swan Riv. App. 15 (1839).
 4. *PETALOSTYLES*, R.Br. in Sturt Exped. Central Austr. App. ii. 79 (1849).
 P. labicheoides, R.Br. in App. Sturt Exped. 80 (1849).
 P. millefolium, E. Pritzel in Engler's Botan. Jahrb. xxxv. 275 (1904).
 5. *CASSIA*, (Tourn.) Linn. Syst. ed. I. (1735).
 C. sophora, Linn. Sp. Pl. 379 (1753).
 C. venusta, F.v.M. Fragm. i. 165 (1859).
 C. notabilis, F.v.M. l. c. iii. 28 (1862).
 C. pleurocarpa, F.v.M. l. c. i. 223 (1859).
 C. neurophylla, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 147 (1918).
 C. retusa, Soland. in Linnaea, xi. 72 (1842).
 C. australis, Sims, in Bot. Mag. t. 2676 (1826).
 C. Chatelainiana, Gaud. in Freyc. Voy. Bot. 485. t. 111 (1826).
 C. glutinosa, D.C. Prodr. ii. 495 (1825).
 C. cladophylla, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 147 (1918).
 C. pruinosa, F.v.M. Fragm. iii. 48 (1862).
 C. phyllodinia, R.Br. in App. Sturt Exped. 15 (1849).
 C. eremophila, A. Cunn. in T. Vog. Gen. Cass. Synops. 47 (1837).
 C. artemisioides, Gaud. in D.C. Prodr. ii. 495 (1825).
 C. Sturtii, R.Br. in App. Sturt Exped. 77 (1849).
 C. desolata, F.v.M. in Linnaea xxv. 389 (1852).
 C. oligophylla, F.v.M. Fragm. iii. 49 (1862).
 C. oligoclada, F.v.M. l. c. 49.
 C. cardiosperma, F.v.M. Fragm. x. 50 (1877).
 C. pumila, Lam. Encycl. Meth. i. 620 (1783).
 C. concinna, Benth. Fl. Austr. ii. 291 (1864).
 C. mimosoides, Linn. Sp. Pl. 379 (1753).
 6. *CAESALPINIA*, Linn. Sp. Pl. 380 (1753).
 C. Bonducella, (Linn.) Fleming in Asiatic Research xi. 159 (1801).

Papilionaceae.

I. Podalyrieae.

1. *JANSONIA*, Kipp. in Proc. Linn. Soc. i. 330 (1847).
J. pimcleoides, (Meissn.) Gardn. comb. nov. (*J. formosa*, Kipp.)
2. *BRACHYSEMA*, R.Br. in Ait. Hort. Kew ed. II. iii. 10 (1811).
B. praemorsum, Meissn. in Lehm. Pl. Preiss. i. 25 (1844).
B. lanceolatum, Meissn. in l. c. i. 24.
B. latifolium, R.Br. in Ait. Hort. Kew ed. II. iii. 10 (1811).
B. sericeum, (Sm.) Domin. New Add. Fl. W. Austr. 25 Prague, (1923)
(*B. undulatum*, Ker.)
B. subcordatum, Benth. Fl. Austr. ii. 11 (1864).
B. bracteolosum, F.v.M. Fragm. iv. 10 (1864).
B. aphyllum, Hook. Bot. Mag. t. 4481 (1849).
B. macrocarpum, Benth. Fl. Austr. ii. 13 (1864).
B. tomentosum, Benth. l. c. 13.
B. Chambersii, (F.v.M.) Benth. l. c. 13.
B. daviesioides, (Turcz.) Benth. l. c. 13.
3. *OXYLOBIUM*, Andrews, Bot. Rep. t. 492 (1809). (*Callistachys*, Vent.)
O. lanceolatum, (Vent.) Druce in Rep. Bot. Exch. Cl. Brit. Is. 1916 638 (1917).
O. ellipticum, (Labill.) R.Br. in Ait. Hort. Kew ed. II. iii. 10 (1811).
O. linearifolium, (Don.) Domin. New Add. Fl. W. Austr. 26, Prague (1923).
(*O. lineare*, Benth.)
O. carinatum, (Meissn.) Benth. Fl. Austr. ii. 18 (1864).
O. spathulatum, (Meissn.) Benth. l. c. 18.
O. obtusifolium, Sweet, Fl. Austral. t. 5 (1827).
O. microphyllum, Benth. Fl. Austr. ii. 19 (1864).
O. tricuspidatum, Meissn. in Lehm. Pl. Preiss. i. 30 (1844).
O. spectabile, Endl. Nov. Stirp. Dec. 2 (1839).
O. atropurpureum, Turcz. in Bull. Soc. Nat. Mosc. i. 250 (1853). (*Nemcia atropurpurea* (Turcz.) Domin.)
O. coriaceum, (Sm.) Gardn. comb. nov. (*O. retusum*, R.Br.)
O. graniticum, S. Moore, in Journ. Linn. Soc. xxxiv. 185 (1898).
O. virgatum, Benth. Fl. Austr. ii. 22 (1864).
O. reticulatum, Meissn. in Lehm. Pl. Preiss. i. 29 (1844).
O. capitatum, Benth. in Enum. pl. Hueg. 28 (1837).
O. cuneatum, Benth. in Lindl. Swan Riv. App. 12 (1839).
O. melinocaula, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 224 (1904).
O. acutum, Benth. Fl. Austr. ii. 24 (1864).
O. parviflorum, Benth. in Lindl. Swan Riv. App. 12 (1839).
O. Kelsoi, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 4 (1904).
O. heterophyllum, (Turcz.) Benth. Fl. Austr. ii. 25 (1864).
O. tetragonophyllum, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 226 (1904).
O. emarginatum, S. Moore, in Journ. Linn. Soc. Bot. xlv. 167 (1920).
3. *CHORIZEMA*, Labill. Voy. I. 405 (1799).
C. Dicksonii, Grah. in Maund. Botanist, t. 106 (1841).
C. nervosum, T. Moore in Gard. Comp. 1852 (1852).
C. varium, Benth. in Lindl. Bot. Reg. 1839. t. 49 (1839).
C. cordatum, Lindl. Bot. Reg. 1838. t. 10 (1838).
C. ilicifolium, Labill. Voy. i. 405. t. 21 (1799).
C. rhombeum, R.Br. in Ait. Hort. Kew ed. II. iii. 9 (1811).
C. diversifolium, D.C. Pl. Rar. Jard. Gen. 7e. 44 (1836).
C. glycinifolium, (Sm.) Druce in Rep. Bot. Exch. Cl. Brit. Is. 1916, 615 (1917). (*C. angustifolium*, Benth.)
C. reticulatum, Meissn. in Lehm. Pl. Preiss. i. 34 (1844).
C. trigonum, Turcz. in Bull. Soc. Nat. Mosc. 1853. i. 254 (1853).
C. genistoides, (Meissn.) Gardn. comb. nov. (*C. humile*, Turcz.)
C. cytisoides, Turcz. in Bull. Soc. Nat. Mosc. 1853. i. 256 (1853).
C. uncinatum, C. Andrews, in Journ. W.A. Nat. Hist. Soc. i. 38 (1904).
C. aciculare, (D.C.), Gardn. comb. nov. (*C. Henchmanni*, R.Br.)
C. ericifolium, Meissn. in Lehm. Pl. Preiss. ii. 209 (1847).
5. *MIRBELIA*, Sm. in Koenig. et Sims Ann. Bot. i. 511 (1805).
M. dilatata, R.Br. in Ait. Hort. Kew ed. II. iii. 21 (1811).

- M. racemosa*, Turcz. in Bull. Soc. Nat. Mosc. i. 282 (1853).
M. subcordata, Turcz. in l. c. 282.
M. ovata, Meissn. in Lehm. Pl. Preiss. i. 77 (1844).
M. floribunda, Benth. in Lindl. Swan Riv. App. 12 (1839).
M. spinosa, Benth. Fl. Austr. ii. 36 (1864).
M. trichocalyx, Domin, New Add., Fl. W. Austr. 28. Prague (1923).
M. depressa, E. Pritzel in Engler's Botan. Jahrb. xxxv. 230 (1904).
M. microphyllodes, S. Moore, in Journ. Bot. 164 (1897).
M. microphylla, (Turcz.) Benth. Fl. Austr. ii. 37 (1864).
M. multicaulis, (Turcz.) Benth. l. c. 37.
M. ramulosa, (Benth.) Gardn. comb. nov. (*M. davisoides*, Benth.)
M. viminalis, (A. Cunn.) Gardn. comb. nov. (*M. oxyclada*, F.v.M.)
6. *ISOTROPIS*, Benth. in Enum. pl. Hueg. 28 (1837).
I. cuneifolia, (Sm.) Domin, New Add. Fl. W. Austr. 28, Prague (1923).
 (*I. striata*, Bth.)
I. Drummondii, Meissn. in Lehm. Pl. Preiss. i. 31 (1844).
I. juncea, Turcz. in Bull. Mosc. i. 251 (1853).
I. canescens, F.v.M. Fragm. x. 51 (1876).
I. atropurpurea, F.v.M. l. c. iii. 16 (1862).
I. Forrestii, F.v.M. in Wing's S. Sc. Rec. ii. 252 (1882).
7. *GOMPHOLOBIUM*, Sm. in Trans. Linn. Soc. iv. 220 (1798).
G. ovatum, Meissn. in Lehm. Pl. Preiss. i. 35 (1844).
G. amplexicaule, Meissn. in l. c. i. 36.
G. polymorphum, R.Br. in Ait. Hort. Kew ed. II. iii. 11 (1811).
G. oboordatum, Turcz. in Bull. Soc. Mosc. i. 258 (1853).
G. marginatum, R.Br. in Ait. Hort. Kew ed. II. iii. 11 (1811).
G. Eatoniae, F.v.M. in Vict. Natur. vi. 38 (1889).
G. Baxteri, Benth. Fl. Austr. ii. 46 (1864).
G. aristatum, Benth. in Ann. Wien. Mus. ii. 72 (1838).
G. burtonioides, Meissn. in Lehm. Pl. Preiss. i. 37 (1844).
G. capitatum, A. Cunn. in Lindl. Bot. Reg. i. 1563 (1839).
G. tomentosum, Labill. in pl. Nov. Holl. i. 106. t. 134 (1804).
G. Preissii, Meissn. in Lehm. Pl. Preiss. i. 40 (1844).
G. viscidulum, Meissn. in l. c. i. 39.
G. Shuttleworthii, Meissn. in l. c. i. 39.
G. venustum, R.Br. in Ait. Hort. Kew ed. II. iii. 12 (1811).
G. Knightianum, Lindl. in Bot. Reg. t. 1468 (1837).
8. *BURTONIA*, R.Br. in Ait. Hort. Kew ed. 2. iii. 13 (1811).
B. subulata, Benth. Fl. Austr. ii. 50 (1864).
B. polyzyga, (F.v.M.) Benth. Fl. Austr. ii. 51 (1864).
B. villosa, Meissn. in Lehm. Pl. Preiss. i. 41 (1844).
B. Hendersoni, (Paxt.) Benth. Fl. Austr. ii. 51 (1864).
B. asperula, S. Moore in Journ. Linn. Soc. Bot. xlv. 167 (1920).
B. viseida, E. Pritzel in Engler's Botan. Jahrb. xxxv. 234 (1904).
B. gompholobioides, F.v.M. Fragm. x. 34 (1876).
B. scabra, R.Br. in Ait. Hort. Kew ed. II. iii. 12 (1811).
B. conferta, D.C. Prodr. ii. 106 (1825).
B. simplicifolia, F.v.M. et Tate in Trans. Roy. Soc. S. Austr. xvi. 348 (1896).
9. *JACKSONIA*, R.Br. in Ait. Hort. Kew ed. 2. iii. 12 (1811).
J. floribunda, Endl. in Ann. des Wien. Mus. ii. 197 (1838).
J. carduacea, Meissn. in Bot. Zeit. 1855, 25 (1855).
J. decumbens, E. Pritzel in Engler's Botan. Jahrb. xxxv. 238 (1904).
J. eremodendron, E. Pritzel. in l. c. 239.
J. argentea, Gardn. in Bull. Forests Dep. xxxii. 54 (1923).
J. grevilleoides, Turcz. in Bull. Mosc. xxvi. i. 259 (1853).
J. petrophiloides, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 148 (1918).
J. aculeata, W. V. Fitzg. in l. c. 149.
J. foliosa, Turcz. in Bull. Mosc. xxvi. i. 260 (1853).
J. spinosa, (Labill.) R.Br. in Ait. Hort. Kew ed. 2. iii. 13 (1811).
J. stricta, Meissn. in Bot. Zeit. xiii. 27 (1855).
J. hakeoides, Meissn. in Lehm. Pl. Preiss. i. 45 (1844).
J. furecellata, (Bonpl.) D.C. Prodr. ii. 107 (1824).
J. horrida, D.C. l. c. 107.

- J. mollissima*, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. ii. 22 (1905).
J. sericea, Benth. in Enum. pl. Hueg. 31 (1837).
J. Sternbergiana, Hug. Bot. Arkiv. t. 3 (1837).
J. Forrestii, F.v.M. in Proc. Linn. Soc. N.S.W. ser. II. ii. 194 (1887).
J. thesioides, (A. Cunn.) Benth. in Ann. Wien. Mus. ii. 74 (1838).
J. compressa, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 260 (1853).
J. calycina, Domin, New Add. Flora W. Austr. 31 Prague (1923).
J. cupulifera, Meissn. in Bot. Zeit. 27 (1855).
J. restioides, Meissn. in Lehm. Pl. Preiss. i. 46 (1844).
J. velutina, Benth. Fl. Austr. ii. 60 (1864).
J. Lehmanni, Meissn. in Lehm. Pl. Preiss. i. 46 (1844).
J. racemosa, Meissn. in l. c. ii. 212 (1847). (*J. hemisericea*, Herbert.)
J. umbellata, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 261 (1853).
J. nematoclada, F.v.M. Fragm. x. 50 (1876).
J. rhadinoclada, F.v.M. l. c. 38.
J. capitata, Meissn. in Lehm. Pl. Preiss. i. 45 (1844).
J. alata, Benth. in Enum. pl. Hueg. 30 (1837).
J. aphylla, (Turcz.) Druce in Rep. Bot. Exch. Cl. Brit. Isles 1916. 629 (1917).
 (*J. piptomcris*, Benth.)
J. pteroclada, F.v.M. Fragm. x. 37 (1876).
J. macrocalyx, Meissn. in Bot. Zeit. 1855. 26 (1855).
10. *SPHAEROLOBIUM*, Sm. in Koenig et Sims Ann. Bot. i. 509 (1805).
S. linophyllum, (Hueg.) Benth. Fl. Austr. ii. 64 (1864).
S. nudiflorum, (Meissn.) Benth. l. c. 64.
S. gracile, Benth. l. c. 64.
S. racemulosum, Benth. l. c. 65.
S. alatum, Benth. in Enum. pl. Hueg. 32 (1837).
S. vimineum, Sm. in Koenig et Sims, Ann. Bot. i. 509 (1805).
S. grandiflorum, (R.Br.) Benth. in Enum. pl. Hueg. 32 (1837).
S. fornicatum, Benth. l. c. 32.
S. medium, R.Br. in Ait. Hort. Kew ed. 2. iii. 14 (1811).
S. scabriusculum, Meissn. in Lehm. Pl. Preiss. ii. 214 (1847).
S. macranthum, Meissn. in l. c. 213.
S. daviesioides, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 266 (1853).
11. *VIMINARIA*, Smith Exotic Bot. 51. t. 27 (1804).
V. denudata, Sm. Exot. Bot. 51. t. 27 (1804).
12. *ERICHSENIA*, Hemsl. in Hook. Ic. plant. t. 2777 (1905).
E. uncinata, Hemsl. in Hook. Ic. plant. t. 2777 (1905).
13. *DAVIESIA*, Sm. in Trans. Linn. Soc. iv. 220 (1798).
 Series 1. *Involucratae*, Benth.
 D. cordata, Sm. in Trans. Linn. Soc. ix. 259 (1808).
 D. ovata, Benth. Fl. Austr. ii. 72 (1864).
 D. crenulata, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 265 (1853).
 D. oppositifolia, Endl. in Ann. Wien. Mus. ii. 199 (1838).
 D. alternifolia, Endl. in l. c. 199.
 D. elongata, Benth. Fl. Austr. ii. 74 (1864).
 Series 2. *Umbellatae*, Benth.
 D. pedunculata, Benth. in Lindl. Swan Riv. App. 14 (1839).
 D. arthropoda, F.v.M. Fragm. viii. 22 (1874).
 D. mollis, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 263 (1853).
 Series 3. *Racemosae*, Benth.
 D. costata, E. Cheel, in Journ. Roy. Soc. W.A. vi. (pt. i.) 35 (1920).
 D. buxifolia, Benth. Fl. Austr. ii. 75 (1864).
 D. horrida, Meissn. in Lehm. Pl. Preiss. i. 54 (1844).
 D. reclinata, (A. Cunn.) Benth. Fl. Austr. ii. 77 (1864).
 D. obtusifolia, F.v.M. Fragm. ii. 104 (1861).
 D. obovata, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 261 (1853).
 Series 4. *Calamiformes*, Benth.
 D. Croniniana, F.v.M. in Vict. Nat. x. 194 (1894).
 D. longifolia, Benth. in Lindl. Swan Riv. App. 14 (1839).
 D. chordophylla, Meissn. in Lehm. Pl. Preiss. i. 48 (1844).
 D. nematophylla, (F.v.M.) Benth. Fl. Austr. ii. 78 (1864).

Series 5. *Fasciculatae*, Benth.

- D. daphnoides, Meissn. in Lehm. Pl. Preiss. i. 54 (1844).
- D. nudiflora, Meissn. in l. c. 53.
- D. rhombifolia, Meissn. in l. c. 56.
- D. cardiophylla, F.v.M. Fragm. ii. 105 (1861).
- D. Drummondii, Meissn. in Lehm. Pl. Preiss. i. 53 (1844).
- D. ulicina, Sm. in Koenig et Sims Ann. Bot. i. 506 (1805).
- D. Grahami, Ewart et Jean White, in Proc. Roy. Soc. Vict. n. s. xxii. 12 (1909).
- D. uniflora, Herbert, in Journ. Roy. Soc. W.A. viii. 37 (1922).

Series 6. *Teretifoliae*, Benth.

- D. pachyphylla, F.v.M. Fragm. iv. 15 (1864).
- D. teretifolia, (R.Br.) Benth. Fl. Austr. ii. 82 (1864).
- D. hakeoides, Meissn. in Lehm. Pl. Preiss. i. 47 (1844).
- D. colletioides, Meissn. in l. c. 48.
- D. reversifolia, F.v.M. Fragm. i. 145 (1859).
- D. incrassata, Sm. in Trans. Linn. Soc. ix. 255 (1808).
- D. brevifolia, Lindl. in Mitch. Three Exped. Austr. ii. 201 (1838).
- D. acanthoclona, F.v.M. Fragm. x. 32 (1876).
- D. Preissii, Meissn. in Lehm. Pl. Preiss. i. 50 (1844).
- D. spinosissima, Meissn. in l. c. 51.
- D. pachyline, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 263 (1853).

Series 7. *Verticales*, Benth.

- D. quadrilaterata, Benth. in Lindl. Swan Riv. App. 14 (1839).
- D. striata, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 264 (1853).
- D. polyphylla, Benth. in Lindl. Swan Riv. App. 14 (1839).
- D. microphylla, Benth. Fl. Austr. ii. 86 (1864).
- D. Dielsii, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 249 (1904).

Series 8. *Decurrentes*, Benth.

- D. flexuosa, Benth. in Enum. pl. Hueg. 32 (1837).
- D. pectinata, Lindl. in Mitch. Three Exped. Austr. ii. 151 (1838).
- D. trigonophylla, Meissn. in Lehm. Pl. Preiss. ii. 213 (1847).
- D. epiphylla, Meissn. in Bot. Zeit. 27 (1855).

Series 9. *Aphyllae*, Benth.

- D. euphorbioides, Benth. Fl. Austr. ii. 88 (1864).
- D. divaricata, Benth. in Enum. pl. Hueg. 31 (1837).
- D. paniculata, Benth. in l. c. 31.
- D. aphylla, (F.v.M.) Benth. Fl. Austr. ii. 88 (1864).
- D. juncea, Sm. in Trans. Linn. Soc. ix. 260 (1808).

14. *AOTUS*, Sm. in Koenig et Sims Ann. of Bot. i. 504 (1805).

- A. villosa, Sm. in Ann. Bot. i. 504 (1805).
- A. Preissii, Meissn. in Lehm. Pl. Preiss. ii. 214 (1847).
- A. phyllicoides, (F.v.M.) Benth. Fl. Austr. ii. 92 (1864).
- A. genistoides, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 268 (1853).
- A. carinata, Meissn. in Lehm. Pl. Preiss. ii. 215 (1847).
- A. passerinoides, Meissn. in l. c. i. 61 (1844).
- A. diffusa, Gardn. Ms.
- A. Tietkinsii, F.v.M. Fragm. x. 33 (1876).
- A. cordifolia, Benth. in Enum. pl. Hueg. 33 (1837).

15. *PHYLLOTA*, Benth. in Enum. Pl. Hueg. 33 (1837).

- P. barbata, Benth. in Enum. pl. Hueg. 33 (1837).
- P. gracilis, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 267 (1853).

16. *PULTENAEA*, Sm. Bot. Nov. Holl. 35 t. 12 (1793).

- P. Luehmanni, Maiden in Vict. Nat. xxii. 100.
- P. Georgei, (Hemsl.) Gardn. comb. nov. (*Phyllota Georgei*, Hemsl.)
- Pultenaea astipulea*, Herbert.)
- P. humilis, (S. Moore) Gardn. comb. nov. (*Phyllota humilis*, S. Moore.)
- P. capitata, (Turcz.) Gardn. comb. nov. (*Pultenaea urodon*, Benth.)
- P. arachnoidea, Gardn. Ms.
- P. lycopodioides, (S. Moore), Gardn. comb. nov. (*Phyllota lycopodioides*, S. Moore.)
- P. Skinneri, F.v.M. Fragm. viii. 166 (1874).

- P. Drummondii*, Meissn. in Lehm. Pl. Preiss. ii. 219 (1847).
P. barbata, C. Andrews, in Journ. W.A. Nat. Hist. Soc. i. 38 (1904).
P. pinifolia, Meissn. in Lehm. Pl. Preiss. ii. 220 (1847).
P. conferta, Benth. Fl. Austr. ii. 118 (1864).
P. pauciflora, Scott in Kew Bull. 1914, 378 (1914).
P. reticulata, (Sm.) Benth. Fl. Austr. ii. 119 (1864).
P. ochreata, Meissn. in Lehm. Pl. Preiss. i. 75 (1844).
P. aspalathoides, Meissn. in Lehm. Pl. Preiss. i. 73.
P. obeordata, (R.Br.) Benth. Fl. Austr. ii. 120 (1864).
P. arida, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 258 (1904).
P. rotundifolia, (Turcz.) Benth. Fl. Austr. ii. 121 (1864).
P. calycina, (Turcz.) Benth. l. c. 121.
P. spinulosa, (Turcz.) Benth. l. c. 121.
P. cymbifolia, J. M. Black, in Trans. Roy. Soc. South Austr. xxxix. 96 (1915).
P. vestita, R.Br. in Ait. Hort. Kew ed. 2. iii. 19 (1811).
P. strobilifera, Meissn. in Lehm. Pl. Preiss. i. 75 (1844).
P. ericifolia, Benth. in Lindl. Swan Riv. App. 13 (1839).
P. verruculosa, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 278 (1853).
P. empetrifolia, Meissn. in Lehm. Pl. Preiss. i. 76 (1844).
P. radiata, H. B. Williamson, in Proc. Roy. Soc. Viet. xxxiii. (n.s.) 137 (1921).
P. adunca, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 279 (1853).
P. neurocalyx, Turcz. l. c. 281.
P. tenuifolia, R.Br. in Bot. Mag. t. 2086 (1819).
17. *GASTROLOBIUM*, R.Br. in Ait. Hort. Kew ed. 2. iii. 16 (1811).
 Series i. *Axillares*, Benth.
G. pyramidale, T. Moore, in Gard. Comp. i. 81 (1852).
G. Lehmanni, Meissn. in Lehm. Pl. Preiss. i. 70 (1844).
G. pulchellum, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 274 (1853).
G. stipulare, Meissn. in Lehm. Pl. Preiss. ii. 218 (1847).
G. Brownii, Meissn. in l. c. i. 71 (1844).
G. reticulatum, (Meissn.) Benth. Fl. Austr. ii. 99 (1864).
G. truncatum, Benth. l. c. 99.
G. erispifolium, Domin, New Add. Fl. W. Austr. 35 Prague (1923).
G. spathulatum, Benth. in Lindl. Swan Riv. App. 14 (1839).
G. Stowardi, S. Moore, in Journ. Linn. Soc. Bot. xlv. 169 (1920).
G. plicatum, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 274 (1853).
G. tricuspidatum, Meissn. in Lehm. Pl. Preiss. i. 66 (1844).
G. obovatum, Benth. in Lindl. Swan Riv. App. 14 (1839).
G. epacridioides, Meissn. in Lehm. Pl. Preiss. i. 72 (1844).
G. trilobum, Benth. in Lindl. Swan Riv. App. 13 (1839).
G. ilicifolium, Meissn. in Lehm. Pl. Preiss. i. 67 (1844).
 Series ii. *Racemosae*, Benth.
G. villosum, Benth. in Lindl. Swan Riv. App. 13 (1839).
G. polystachyum, Meissn. in Lehm. Pl. Preiss. ii. 217 (1847).
G. ovalifolium, Henfr. in Gard. Comp. i. 41 (1852).
G. grandiflorum, F.v.M. Fragm. iii. 17 (1862).
G. pyenostachyum, Benth. Fl. Austr. ii. 103 (1864).
G. spinosum, Benth. in Lindl. Swan Riv. App. 13 (1839).
G. rotundifolium, Meissn. in Lehm. Pl. Preiss. ii. 216 (1847).
G. densifolium, Gardn. in Journ. Roy. Soc. W.A. xii. 69 (1926).
G. floribundum, S. Moore, in Journ. Linn. Soc. Bot. xlv. 170 (1920).
G. microcarpum, Meissn. in Lehm. Pl. Preiss. i. 70 (1844).
G. oxylobioides, Benth. in Lindl. Swan Riv. App. 13 (1839).
G. calycinum, Benth. in l. c. 13. (*G. sagittulatum*, S. Moore.)
G. Callistachys, Meissn. in Lehm. Pl. Preiss. ii. 216 (1847).
G. Forrestii, Ewart in Journ. Roy. Soc. N.S. Wales, (1908) xlii. 188 (1909).
G. stenophyllum, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 275 (1853).
G. crassifolium, Benth. Fl. Austr. ii. 105 (1864).
G. parvifolium, Benth. in Lindl. Swan Riv. App. 13 (1839).
G. hamulosum, Meissn. in Lehm. Pl. Preiss. ii. 218 (1847).
G. velutinum, Lindl. in Paxt. Fl. Gard. iii. 76. f. 270 (1853).
G. bidens, Meissn. in Bot. Zeit. xiii. 29 (1855). (*G. Laytonii*, J. White.)
G. bilobum, R.Br. in Ait. Hort. Kew ed. 2. iii. 16 (1811).
G. seorsifolium, F.v.M. Fragm. x. 35 (1876).

18. *EUTAXIA*, R.Br. in Ait. Hort. Kew ed. 2. iii. 16 (1811).
E. cuneata, Meissn. in Lehm. Pl. Preiss. i. 65 (1844).
E. obovata, (Labill.) Gardn. comb. nov. (*E. myrtifolia*, R.Br.)
E. epacridioides, Meissn. in Lehm. Pl. Preiss. i. 64 (1844).
E. virgata, Benth. in Enum. Pl. Hueg. 34 (1837).
E. densifolia, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 271 (1853).
E. dillwynioides, Meissn. in Lehm. Pl. Preiss. i. 63 (1844).
E. parvifolia, Benth. in Enum. pl. Hueg. 34 (1837).
E. microphylla, (R.Br.) Gardn. comb. nov. (*E. empetrifolia*, Schlecht.)
19. *LATROBEA*, Meissn. in Lehm. Pl. Preiss. ii. 219 (1847).
L. abnormis, (F.v.M.) Druce, in Rep. Bot. Exch. Cl. Brit. Isles, 1916, 631 (1917). (*L. pungens*, Benth.)
L. genistoides, Meissn. in Lehm. Pl. Preiss. ii. 219 (1847).
L. Brunonis, (Benth.) Meissn. in l. c. 219.
L. tenella, (Meissn.) Benth. Fl. Austr. ii. 141 (1864).
L. hirtella, (Turcz.) Benth. l. c. 142.
L. diosmifolia, Benth. l. c. 142.
20. *DILLWYNIA*, Sm. in Koenig et Sims, Ann. of. Bot. i. 510 (1805).
D. incerta, Domin, Zvlavno Otisk Z Vestnika Kral. Cec. Spole. Nauk II. 37 (1923).
D. dillwynioides, (Meissn.) Druce in Rep. Bot. Exch. Cl. Brit. Is. 620 (1917). (*D. Preissii*, Benth.)
D. acerosa, S. Moore, in Journ. Linn. Soc. Bot. xxxiv. 187 (1898).
D. pungens, (Sweet) Mackay, in den Annal des Wien. Mus. ii. 79 (1838).
D. cinerascens, R.Br. in Bot. Mag. t. 2247 (1821).
D. divaricata, (Turcz.) Benth. Fl. Austr. ii. 151 (1864).
D. uncinata, (Turcz.) Gardn. comb. nov. (*D. patula*, F.v.M.)
21. *EUCHILOPSIS*, F.v.M. in Melb. Chemist June (1882).
E. linearis, (Benth.) F.v.M. in Melb. Chem. June (1882). (*Sphaerolobium euchilus*, Benth.)
- II. Genisteae.
22. *BOSSIAEA*, Vent. Jard. Cels. i. 7. t. 7 (1800).
 Series i. *Oppositifoliae*, Benth.
B. dentata, (R.Br.) Benth. Fl. Austr. ii. 156 (1864).
B. aquifolium, Benth. l. c. 157.
B. Laidlawiana, Tovey et Morris in Proc. Roy. Soc. Vict. (n.s.) xxxiv. 207 (1922).
B. Webbii, F.v.M. in Melb. Chem. et Drugg. Dec. (1882).
B. strigillosa, Benth. Fl. Austr. ii. 157 (1864).
- Series ii. *Normales*, Benth.
B. biloba, Benth. in Enum. pl. Hueg. 36 (1837).
B. Preissii, Meissn. in Lehm. Pl. Preiss. i. 82 (1844).
B. concinna, Benth. Fl. Austr. ii. 161 (1864).
B. linophylla, R.Br. in Ait. Hort. Kew ed. 2. iv. 268 (1812).
B. disticha, Lindl. Bot. Reg. 1841, Misc. 38 (1841).
B. pulchella, Meissn. in Lehm. Pl. Preiss. i. 84 (1844).
B. peduncularis, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 287 (1853).
B. rufa, R.Br. in Ait. Hort. Kew ed. iv. 267 (1812).
B. Walkeri, F.v.M. Fragm. ii. 120 (1861).
B. leptacantha, E. Pritzel, in Engler's Botan. Jahrb. xxxv. 263 (1904).
B. phylloclada, F.v.M. in Trans. Phil. Inst. Vict. iii. 52 (1859).
- Series iii. *Eriocarpae*, Benth.
B. ornata, (Lindl.) Benth. Fl. Austr. ii. 158 (1864).
B. eriocarpa, Benth. in Enum. pl. Hueg. 36 (1837).
B. divaricata, Turcz. in Bull. Soc. Nat. Mosc. xxvi. i. 285 (1853).
B. spinosa, (Turcz.) Domin, New Add. Fl. W. Austr. (Prague) 39 (1923). (*B. calycina*, Benth.)
23. *TEMPLETONIA*, R.Br. in Ait. Hort. Kew. ed. 2. iv. 269 (1812).
T. retusa, (Vent.) R.Br. in Ait. Hort. Kew ed. 2. iv. 269 (1812).
T. Drummondii, Benth. Fl. Austr. ii. 169 (1864).

- T. aculeata*, (F.v.M.) Benth. l. c. 170.
T. egena, (F.v.M.) Benth. l. c. 170.
T. Battii, F.v.M. in Melb. Chem. et Drugg. n.s. ii. 31 (1887).
T. sulcata, (Meissn.) Benth. Fl. Austr. ii. 171 (1864).

24. *HOVEA*, R.Br. in Ait. Hort. Kew ed. 2. iv. 275 (1812).
H. acanthoclada, (Turez.) F.v.M. Fragm. iv. 15 (1864).
H. chorizemifolia, (Sweet) D.C. Prodr. ii. 116 (1825).
H. elliptica, (Sm.) D.C. Prodr. ii. 115 (1825). (*H. Celsi*, Bonpl.)
H. trisperma, Benth. in Enum. pl. Hueg. 37 (1837).
H. stricta, Meissn. in Lehm. Pl. Preiss. i. 79 (1844).
H. pungens, Benth. in Enum. pl. Hueg. 37 (1837).

25. *GOODIA*, Salisb. Parad. Lond. t. 41 (1806).
G. lotifolia, Salisb. Parad. Lond. t. 41 (1806).

26. *CROTALARIA*, Dill. ex Linn. Gen. ed. I. 218 (1737).

Sect. i. *Simplicifoliae*, Benth.

- C. alata*, Hamilt. in D. Don. Prodr. Fl. Nepal. 241 (1825).
C. retusa, Linn. Sp. Pl. 715 (1753).
C. Mitchellii, Benth. in Mitch. Journ. Trop. Austr. 120 (1848).
C. linifolia, Linn. fil. Suppl. 322 (1781).
C. membranacea, W. V. Fitzg. in Journ. Roy Soc. W.A. iii. 150 (1918).
C. verrucosa, Linn. Sp. Pl. 715 (1753).
C. crispata, (F.v.M.) Benth. Fl. Austr. ii. 179 (1864).
C. juncea, Linn. Sp. Pl. 714 (1753).

Sect. ii. *Unifoliolatae*, Benth.

- C. Novae-Hollandiae*, D.C. Prodr. ii. 127 (1825).
C. crassipes, Hook. Leon. plant. t. 830 (1852).
C. Cunninghamii, R.Br. in Sturt's Exped. ii. App. 71 (1849).

Sect. iii. *Trifoliolatae*, Bak.

- C. trifoliastrium*, Willd. Sp. Pl. iii. 983 (1753).
C. laburnifolia, Linn. Sp. Pl. 715 (1753).
C. incana, Linn. Sp. Pl. 716 (1753).
C. dissitiflora, Benth. in Mitch. Trop. Austr. 386 (1848).
C. Benthamiana, E. Pritzl, in Engler's Botan. Jahrb. xxxv. 267 (1904).

**LUPINUS*, (Tourn.) Linn. Syst. ed. I. (1735).

**L. pilosus*, Murr. (Europ. austr.)

**L. hirsutus*, Linn. (Reg. Mediterr.)

**L. angustifolius*, Linn. (Reg. Mediterr.)

**L. luteus*, Linn. (Reg. Mediterr.)

**ULEX*, Linn. Syst. ed. I. (1735).

**U. europaeus*, Linn. (Europ. oec.)

**CYTISUS*, Linn. Syst. ed. I. (1735).

**C. prolifer*, Linn. f. (Ins. Canar.)

III. *Trifoliceae*.

27. *TRIGONELLA*, Linn. Gen. ed. i. 351 (1737).
T. suavissima, Lindl. in Mitch. Three Exped. i. 255 (1838).

**MEDICAGO*, (Tourn.) Linn. Gen. ed. i. 225 (1737).

**M. lupulina*, Linn. (Geront. bor. temp.)

**M. orbicularis*, All. (Reg. Mediterr.; Abyss.)

**M. scutellata*, All. (Reg. Mediterr.)

**M. denticulata*, Willd. (Geront. bor. temp.)

**M. apiculata*, Willd. (Geront. bor. temp.)

**M. lacinata*, All. (Reg. Mediterr.)

**M. echinus*, D.C. (Reg. Mediterr.)

**M. arabica*, (Linn.) All. (Europ.) (*M. maculata*, Willd.)

**M. minima*, (Linn.) Grubb. (Europ.)

**MELILOTUS*, (Tourn.) Hall. Enum. Stirp. Helv. ii. 587 (1742).

**M. indica*, All. (Europ.; Asia.)

**M. alba*, Desr. (Europ.; Asia.)

TRIFOLIUM*, (Tourn.) Linn. Gen. ed. i. 229 (1737).Subg. I. *Trifolium*, Gren. et Godr.Sect. i. *Chronosemium*, Ser.T. agrarium*, Linn. (Europ.; Afr. bor.; Oriens.)**T. procumbens*, Linn. (Europ.; Afr. et Asia bor.)**T. dubium*, Sibth. (Europ.)**T. filiforme*, Linn. (Europ. Reg. Cauc.)Sect. ii. *Eumoria*, Gib. et Belli.**T. hybridum*, Linn. (Europ. austr. Asia Min.)**T. repens*, Linn. (Geront. bor. temp.)**T. cernuum*, Brot. (Lusitan.)**T. glomeratum*, Linn. (Europ. occ.; Reg. Mediterr.; Oriens.)**T. suffocatum*, Linn. (Europ. occ.; Reg. Mediterr. et Cauc.)Sect. iii. *Galearia*, Pressl.**T. resupinatum*, Linn. (Europ. occ.; Reg. Mediterr.)**T. tomentosum*, Linn. (Reg. Mediterr.)**T. fragiferum*, Linn. (Europ.; Oriens.; Reg. Himal.)Subg. II. *Lagopus*, Lojac.Sect. i. *Eulagopus*, Lojac.**T. striatum*, Linn. (Europ. austr.; Asia Min.)**T. arvense*, Linn. (Europ.; As. et Afr. bor.; Oriens.)**T. scabrum*, Linn. (Reg. Mediterr.; Oriens.)**T. Alexandrinum*, Linn. (Aegypt.; Asia Min.)**T. incarnatum*, Linn. (Europ. austr.)**T. stellatum*, Linn. (Reg. Mediterr.; Oriens.)**T. pratense*, Linn. (Europ.; Asia temp.)**T. lappaceum*, Linn. (Reg. Mediterr.; Oriens.)**T. Cherleri*, Linn. (Reg. Mediterr.)**T. angustifolium*, Linn. (Reg. Mediterr.; Oriens.)**T. maritimum*, Huds. (Europ. occ.; Reg. Mediterr.)Sect. ii. *Calycomorphum*, Presl.**T. subterraneum*, Linn. (Reg. Mediterr.; Oriens.)**T. globosum*, Linn. (Byzant.; Asia Min.)

IV. Loteae.

28. *LOTUS*, (Tourn.) Linn. Syst. ed. I. (1735).**L. uliginosus*, (Linn.) Schkuhr. (Europ. Reg. Mediterr.)**L. hispidus*, Desf. (Europ. et Afr. bor. occ.)**L. angustissimus*, Linn. (Europ.; Oriens.; As. bor.)*L. australis*, Andr. Bot. Rep. t. 624 (1810).

V. Galegeae.

29. *INDIGOFERA*, Linn. Hort. Cliff. 187 (1737).*I. linifolia*, Retz. Obs. iv. 29 (1786).*I. enneaphylla*, Linn. Mant. ii. 272 (1771).*I. trifoliata*, Linn. Cent. Pl. ii. 29 (1759).*I. trita*, Linn. fil. Suppl. 335 (1781).*I. parviflora*, Heyne in Wall. Cat. 5457 (1828).*I. viscosa*, Lam. in Encycl. Meth. iii. 247 (1789).*I. hirsuta*, Linn. Sp. Pl. 751 (1753).*I. monophylla*, D.C. Prodr. ii. 222 (1825).*I. rugosa*, Benth. Fl. Austr. ii. 199 (1864).*I. australis*, Willd. Sp. Pl. iii. 1235 (1800).*I. Georgei*, E. Pritzel, in Engler's Bot. Jahrb. xxxv. 261 (1904).*I. boviparda*, A. Morrison, in Journ. Bot. i. 166 (1912).*I. brevidens*, Benth. in Mitch. Trop. Austr. 385 (1848).30. *PSORALEA*, Linn. Gen. ed. ii. 358 (1742).*P. badocana*, (Blanco) Benth. Fl. Austr. ii. 190 (1864).*P. Martini*, F.v.M. Fragm. v. 11 (1865).*P. Archeri*, F.v.M. Fragm. iv. 21 p.p. (1864).*P. cuneata*, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 151 (1918).*P. balsamica*, F.v.M. in Trans. Vict. Inst. iii. 55 (1858).

- P. virens*, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 151 (1918).
P. plumosa, F.v.M. Fragm. iv. 22 (1864).
P. pustulata, F.v.M. in Trans. Vict. Inst. iii. 54 (1858).
P. lachnostachys, F.v.M. Fragm. iii. 105 (1863).
P. eriantha, Benth. in Mitch. Trop. Austr. 131 (1848).
P. patens, Lindl. in Mitch. Three Exped. ii. 9 (1838).
P. cinerea, Lindl. in l. c. ii. 65.
P. leucantha, F.v.M. in Trans. Vict. Inst. iii. 54 (1858).
P. Testariae, F.v.M. Fragm. v. 45 (1865).
31. *PTYCHOSEMA*, Benth. in Lindl. Swan Riv. App. 16 (1839).
P. pusillum, Benth. in Lindl. Swan Riv. App. 16 (1839).
P. trifoliatum, F.v.M. in Wing's South Sci. Rec. ii. 72 (1882).
32. *TEPHROSIA*, Pers. Syn. pl. ii. 328 (1807).
T. coriacea, Benth. Fl. Austr. ii. 204 (1864).
T. Forrestiana, F.v.M. Fragm. xi. 98 (1880).
T. uniovulata, F.v.M. l. c. 70.
T. flammea, (F.v.M.) Benth. Fl. Austr. ii. 204 (1864).
T. conspicua, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 152 (1918).
T. leptoclada, Benth. Fl. Austr. ii. 207 (1864).
T. Stuartii, Benth. l. c. 207.
T. eriocarpa, Benth. l. c. 207.
T. phaeosperma, (F.v.M.) Benth. l. c. 208.
T. filipes, Benth. l. c. 208.
T. remotiflora, (F.v.M.) Benth. l. c. 209.
T. stipuligera, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 154 (1918).
T. macrocarpa, Benth. Fl. Austr. ii. 209 (1864).
T. purpurea, Pers. Syn. pl. ii. 330 (1807).
T. Bidwilli, Benth. Fl. Austr. ii. 210 (1864).
T. rosea, (F.v.M.) Benth. l. c. 211.
33. *SESBANIA*, Scop. Introd. 308 (1777).
S. grandiflora, Pers. Synops. pl. ii. 316 (1807).
S. aculeata, Pers. l. c. 316.
S. Ægyptiaca, Pers. l. c. 316.
34. *CLIANTHUS*, Banks et Soland. in G. Don. Syst. ii. 468 (1832).
C. speciosus, (G. Don.) Aschers et Graebn. Syn. Mitteleur. Fl. vi. 725 (1909).
(C. Dampieri, A. Cunn.) (Donia speciosa.)
35. *SWAINSONA*, Salisb. Parad. Lond. i. 28 (1806).
S. phacoides, Benth. in Mitch. Trop. Austr. 363 (1848).
S. Burkei, (F.v.M.) Benth. Fl. Austr. ii. 218 (1864).
S. oligophylla, (F.v.M.) Benth. l. c. 219.
S. occidentalis, F.v.M. Fragm. iii. 46 (1862).
S. paradoxa, W. V. Fitzg. in Journ. W.A. Nat. Hist. Soc. i. 5 (1904).
S. stenodonta, F.v.M. Fragm. xi. 70 (1879).
S. gracilis, Benth. Fl. Austr. ii. 220 (1864).
S. Drummondii, Benth. l. c. 220.
S. Oliveri, F.v.M. in Wing's South. Sci. Rec. ii. 152 (1882).
S. canescens, (Benth.) F.v.M. Fragm. iii. 46 (1862).
S. Beasleyana, F.v.M. in Chem. et Drugg. Austral. 84 (1887).
S. stipularis, F.v.M. in Linnaea xxv. 393 (1852). (*S. phacifolia*, F.v.M.)
S. tenuis, E. Pritzel in Engler's Botan. Jahrb. xxxv. 270 (1904).
S. Kingii, F.v.M. in Trans. Proc. Roy. Soc. Vict. xxii. 53 (1887).
S. oroboides, (F.v.M.) Benth. Fl. Austr. ii. 222 (1864).
S. unifoliolata, F.v.M. Fragm. viii. 226 (1874).
S. microphylla, A. Gray in Bot. Amer. Expl. Exped. i. 410 (1854).
S. colutioides, F.v.M. Fragm. x. 6 (1876).
S. Maculloehiana, F.v.M. Fragm. vii. 25 (1869).
36. *GLYCYRRHIZA*, (Tourn.) Linn. Corr. Gen. 13 (1737).
G. acanthocarpa, (Lindl.) J. M. Black, in Trans. Roy. Soc. S. Austr. xliii. 351 (1919).

VI. Hedysareae.

37. *ÆSCHYNOME*, Linn. Gen. ed. i. 350 (1737).
Æ. indica, Linn. Sp. Pl. 713 (1753).
38. *ZOENIA*, Gmel. Syst. 1076, 1096 (1791).
Z. diphylla, Pers. Syn. ii. 218 (1807).
39. *DESMODIUM*, Desv. Journ. Bot. i. 122. t. 5 (1813).
D. biarticulatum, (D.C.) F.v.M. Fragm. ii. 121 (1861).
D. campylocaulon, (F.v.M.) Benth. Fl. Austr. ii. 233 (1864).
D. neurocarpum, Benth. l. c. 234.
D. trichostachyum, Benth. l. c. 234.
D. parvifolium, D.C. Prodr. ii. 334 (1825).
40. *ALYSICARPUS*, Neck. elem. Bot. iii. 15 (1790).
A. rugosus, (Willd.) D.C. Prodr. ii. 353 (1825).
A. Cheelii, Gardn. in Bull. For. Dep. xxxii. 57 (1923).
41. *URARIA*, Desv. Journ. Bot. i. 122. t. 5. f. 19 (1813).
U. cylindracea, Benth. Fl. Austr. ii. 237 (1864).

VII. Viciae.

- **VICIA*, (Tourn.) Linn. Syst. ed. i. (1735).
 **V. sativa*, Linn. (Europ.; Afr. bor.; Oriens.)
 **V. hirsuta*, (Linn.) S. F. Gray. (Europ.; Asia et Afr. bor.)
 **V. tetrasperma*, (Linn.) Moench. (Europ.; Oriens.)
 **LATHYRUS*, (Tourn.) Linn. Syst. ed. i. (1735).
 **L. latifolius*, Linn. (Europ.)
 **L. odoratus*, Linn. (Italia.)
42. *ABRUS* Linn. Hort. Cliff. 488 (1737).
A. precatorius, Linn. Syst. ed. xii. 533 (1767).

VIII. Phaseoleae.

43. *GLYCINE*, Linn. Gen. ed. i. 349 (1737).
G. falcata, Benth. Fl. Austr. ii. 243 (1864).
G. clandestina, Wendl. Bot. Beob. 54 (1798).
G. tabacina, (Labill.) Benth. Fl. Austr. ii. 245 (1864).
G. sericea, (F.v.M.) Benth. l. c. 245.
44. *KENNEDYA*, Vent. Jard. Malm. 104. t. 104 (1804).
K. nigricans, Lindl. Bot. Reg. t. 1715 (1835).
K. Beckxiana, F.v.M. Fragm. xi. 58 (1880).
K. prorepens, F.v.M. l. c. viii. 225 (1874).
K. prostrata, R.Br. in Ait. Hort. Kew ed. 2. iv. 299 (1812).
K. eximia, Lindl. in Paxt. Mag. xvi. 35 (1849).
K. microphylla, Meissn. in Lehm. Pl. Preiss. i. 91 (1844).
K. carinata, (Benth.) Domin, New Add. Fl. West. Austr. (Prague) 41 (1923). (*K. parviflora*, Meissn.)
K. Stirlingii, Lindl. Bot. Reg. t. 1845 (1837).
K. glabrata, (Benth.) Lindl. l. c. t. 1838 (1837).
K. macrophylla, (Meissn.) Benth. Fl. Austr. ii. 252 (1864).
K. coccinea, Vent. Jard. Malm. 104. t. 105 (1804).
45. *HARDENBERGIA*, Benth. in Enum. pl. Hueg. 40 (1837).
H. Comptoniana, (Andr.) Benth. in Enum. pl. Hueg. 41 (1837).
46. *ERYTHINA*, Linn. Gen. ed. i. 216 (1737).
E. vespertilio, Benth. in Mitch. Trop. Austr. 218 (1848).
47. *CANAFALIA*, D.C. Mem. Leg. ix. 375 (1825).
C. ensiformis, D.C. Prodr. ii. 404 (1825).
C. obtusifolia, D.C. l. c. 404.
48. *ATYLOSIA*, Wight et Arnott, Prodr. 257 (1834).
A. marmorata, (R.Br.) Benth. Fl. Austr. ii. 263 (1864).
A. lanceolata, W. V. Fitzg. in Journ. Roy. Soc. W.A. iii. 156 (1918).
A. grandifolia, (F.v.M.) Benth. Fl. Austr. ii. 264 (1864).
A. cinerea, (F.v.M.) Benth. l. c. 264.

49. *RYNCHOSIA*, Lour. Fl. Cochinch. 460 (1790).
R. rhomboidea, (F.v.M.) Benth. Fl. Austr. ii. 265 (1864).
R. acutifolia, (F.v.M.) Benth. l. c. 266.
R. rostrata, Benth. l. c. 266.
R. minima, D.C. Prodr. ii. 385 (1825).
R. australis, Benth. Fl. Austr. ii. 267 (1864).
50. *FLEMINGIA*, Roxb. in Ait. Hort. Kew ed. 2. iv. 349 (1812).
F. lineata, Roxb. in Ait. Hort. Kew ed. 2. iv. 350 (1812).
F. pauciflora, Benth. Fl. Austr. ii. 269 (1864).
51. *PHASEOLUS*, (Tourn.) Linn. Syst. ed. i. (1735).
P. vulgaris, Linn. Sp. Pl. 723 (1735). (? indigenous.)
52. *VIGNA*, Savi. Dissert. 6 (1824).
V. lanceolata, Benth. in Mitch. Trop. Austr. 350 (1848).
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